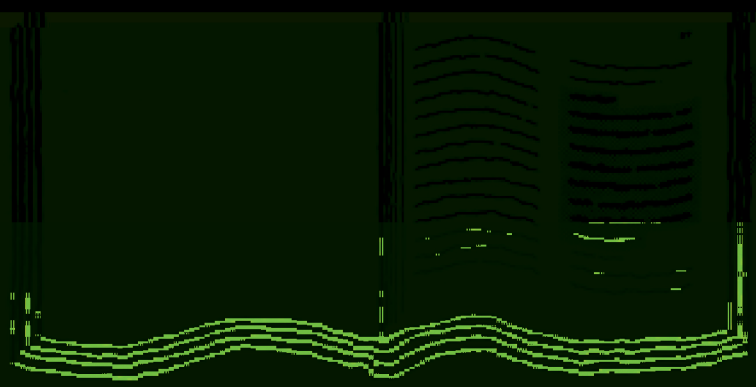
soil survey of
Jim Wells County, Texas

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Texas Agricultural Experiment Station

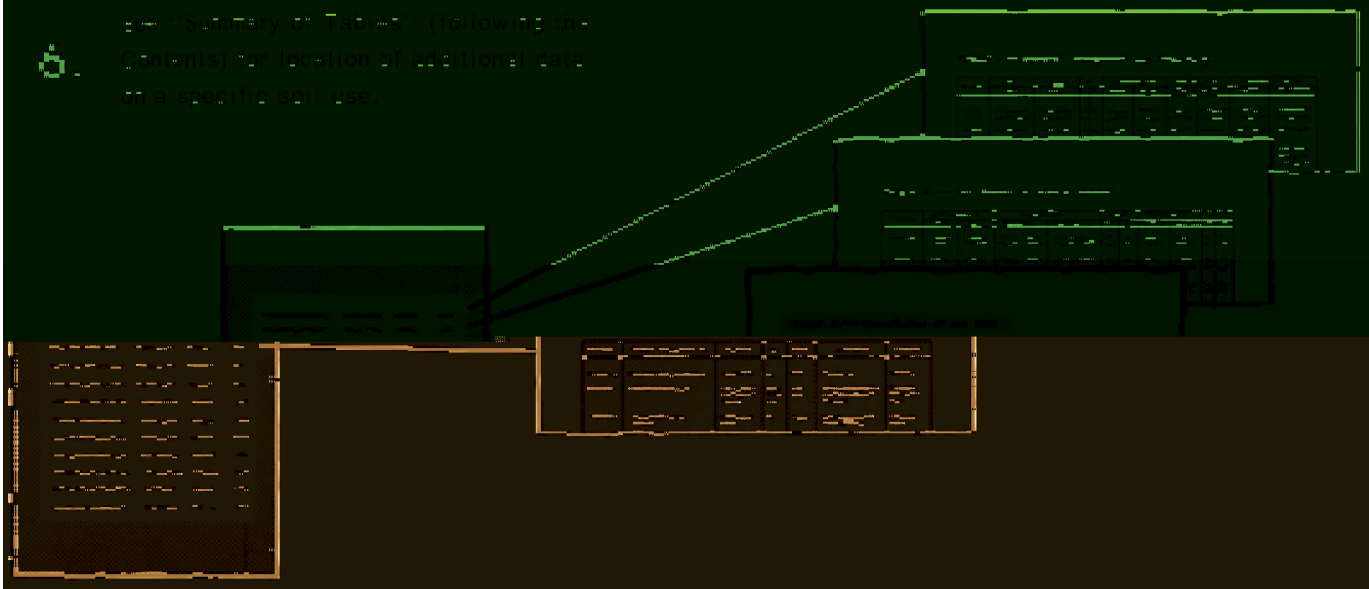
HOW TO USE

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



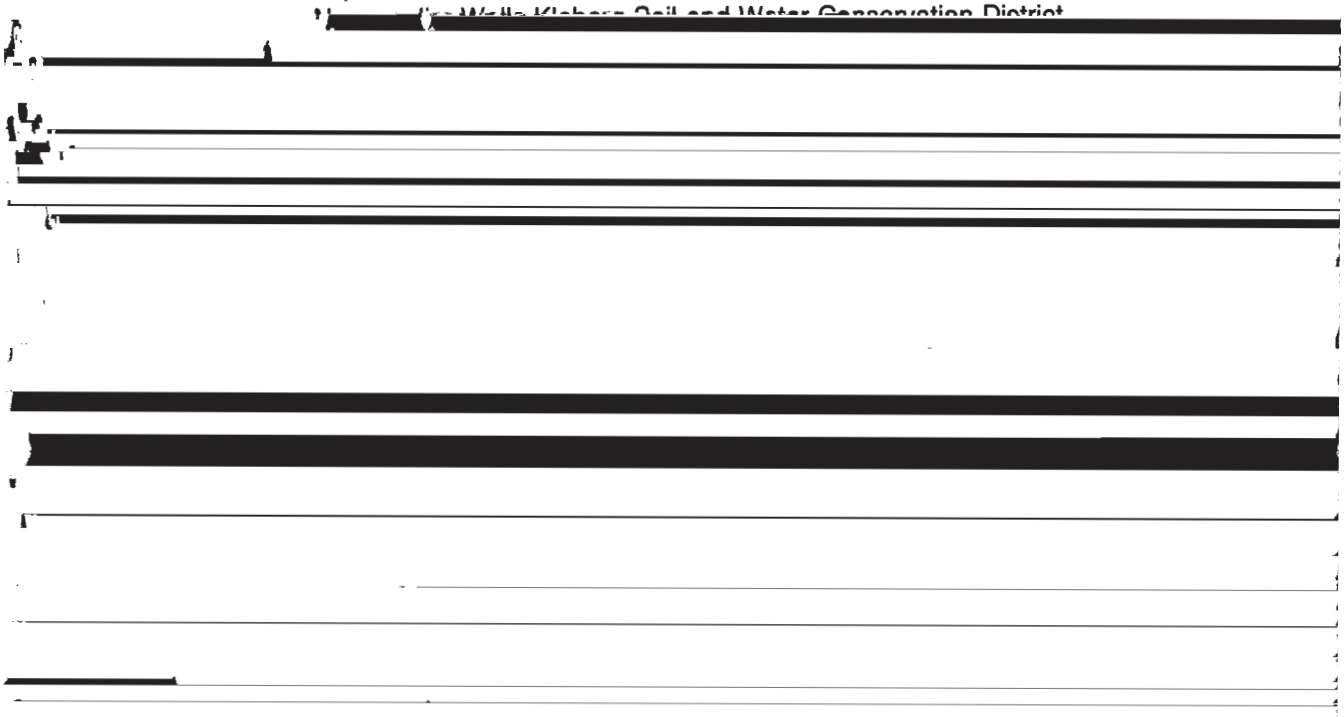
6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



"Contents" for parts of the publication that will meet your specific needs.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1974. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the [redacted]



Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

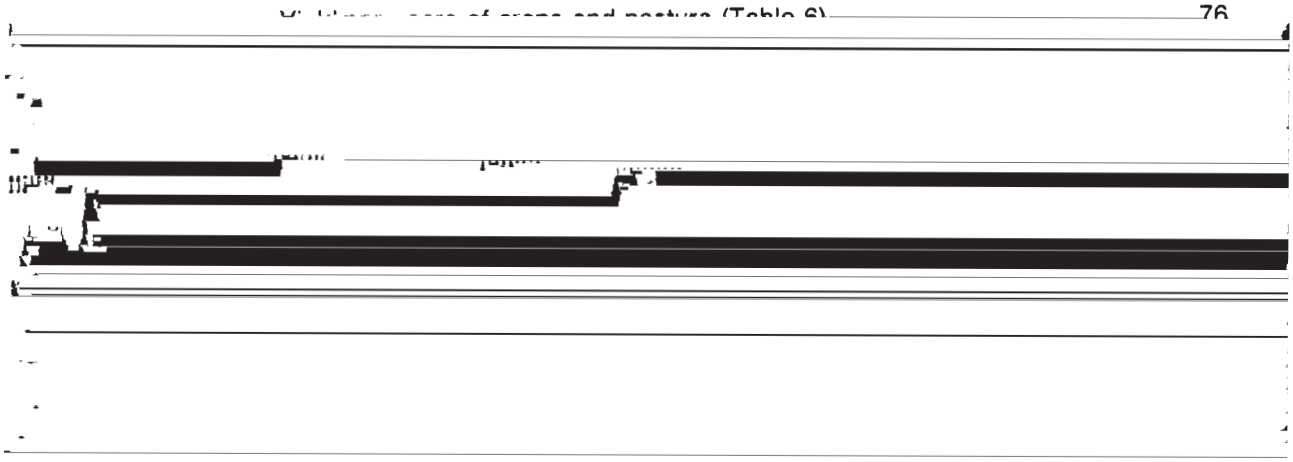
Contents

Issued November 1979

Index to map units

Summary of tables

Summary of tables—Continued



Grain sorghum. Cotton lint. Flax. Pasture.

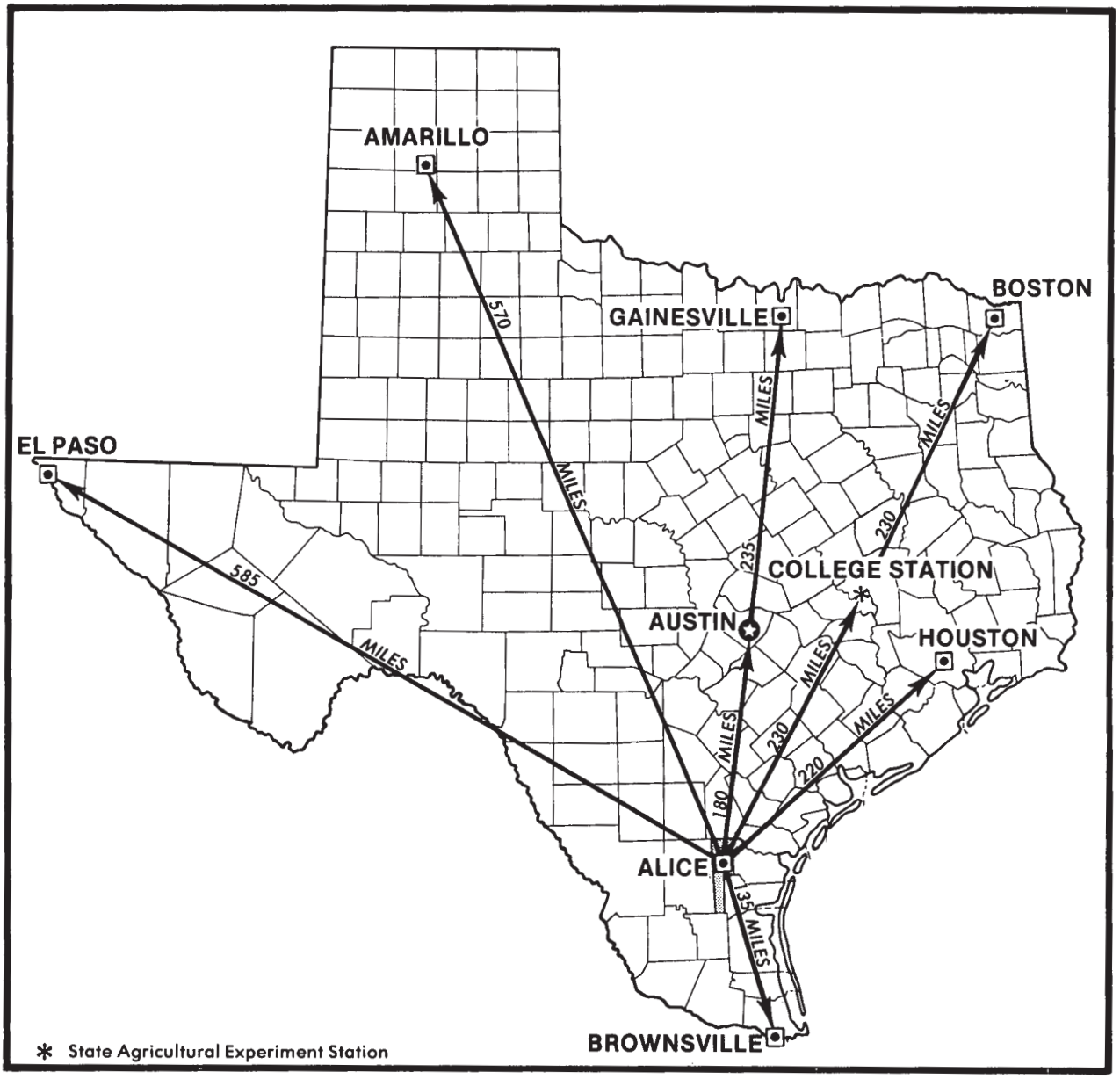
Foreword

This soil survey contains much information useful in land-planning programs in Jim Wells County. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in

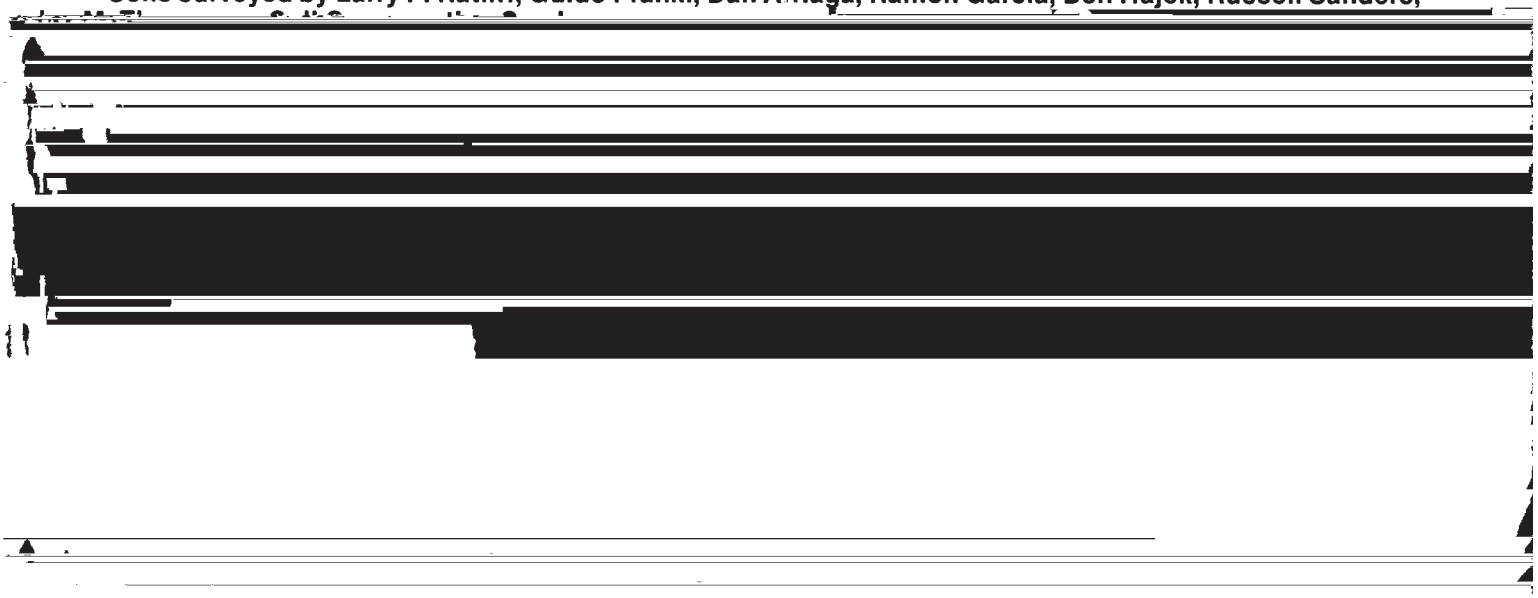


Location of Jim Wells County in Texas.

SOIL SURVEY OF JIM WELLS COUNTY, TEXAS

By Fred E. Minzenmayer, Soil Conservation Service

Soils surveyed by Larry F. Ratliff, Guido Franki, Dan Arriaga, Ramon Garcia, Ben Hajek, Russell Sanders,



United States Department of Agriculture, Soil Conservation Service,
in cooperation with Texas Agricultural Experiment Station

JIM WELLS COUNTY is in the southern part of Texas. It covers an area of 542,080 acres, or 847 square miles, of which 1,216 acres is water. Elevation ranges from 100 to 400 feet above sea level. The average annual rainfall is 26.6 inches, mean annual temperature is 72.4 degrees F, and the growing season is 289 days.

Ranching and farming and oil and gas production are important enterprises in the county. About 75 percent of the county, mostly the western and southwestern parts, is nearly level to sloping rangeland and pastureland. About 22 percent, the northern and northeastern parts, is

In 1970, the population of the county was 33,032. Alice, the county seat, is in the center of the county and has a population of 20,121 (*3*).

Climate

Jim Wells County has hot summers and fairly warm winters. Cold spells or snowfalls are rare. Rains are usually heaviest late in spring and early in fall. Rain in the fall is often associated with a dissipating tropical storm. Total annual precipitation is usually adequate for

The surface of the Lissie Formation is characterized by a flat, nearly level to gently undulating plain. Streams [redacted] fringes of trees along their courses. The formation is about 200 feet thick and outcrops in a belt about 30 miles wide parallel to the coastal plain at a distance of about 50 miles from the coast. Typically, the Lissie Formation consists of about 60 percent sand, 20 percent sandy clay, 10 percent clay, and 10 percent gravel. The sand is made up mostly of quartz and chert grains. The deposits probably began during the Glacial Epoch and were laid down by violent flooding. The Lissie Formation lies unconformably to the northwest over the Goliad Formation.

The surface of the Beaumont Formation is characterized by a flat, treeless plain that is not cut by broad valleys. The formation is 450 to 900 feet thick but averages about 700 feet. Typically, the Beaumont Formation [redacted]

are made up of two or more kinds of soil, and a few have little or no soil. Map units are described under [redacted] "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

[redacted]

other map units, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each map unit is rated for cultivated farm crops, rangeland, urban uses, and recreation uses. Cultivated farm crops are those grown extensively by farmers in the

flax. Rangeland refers to land on which the native vegetation is used for grazing. Urban uses include residential, commercial, and industrial developments. Recreation

Most areas of these soils are used for cultivated crops. Cotton, grain sorghum, and flax are the main cultivated crops. A few areas are in improved pasture of coastal bermudagrass.

The soils in this group have low potential for urban and recreation uses.

1. Lattas-Opelika-Clareville

Somewhat poorly drained and well drained, very slowly permeable and moderately slowly permeable, clayey and loamy soils

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 3 percent. It makes up about 23 percent of the county. It is about 40 percent

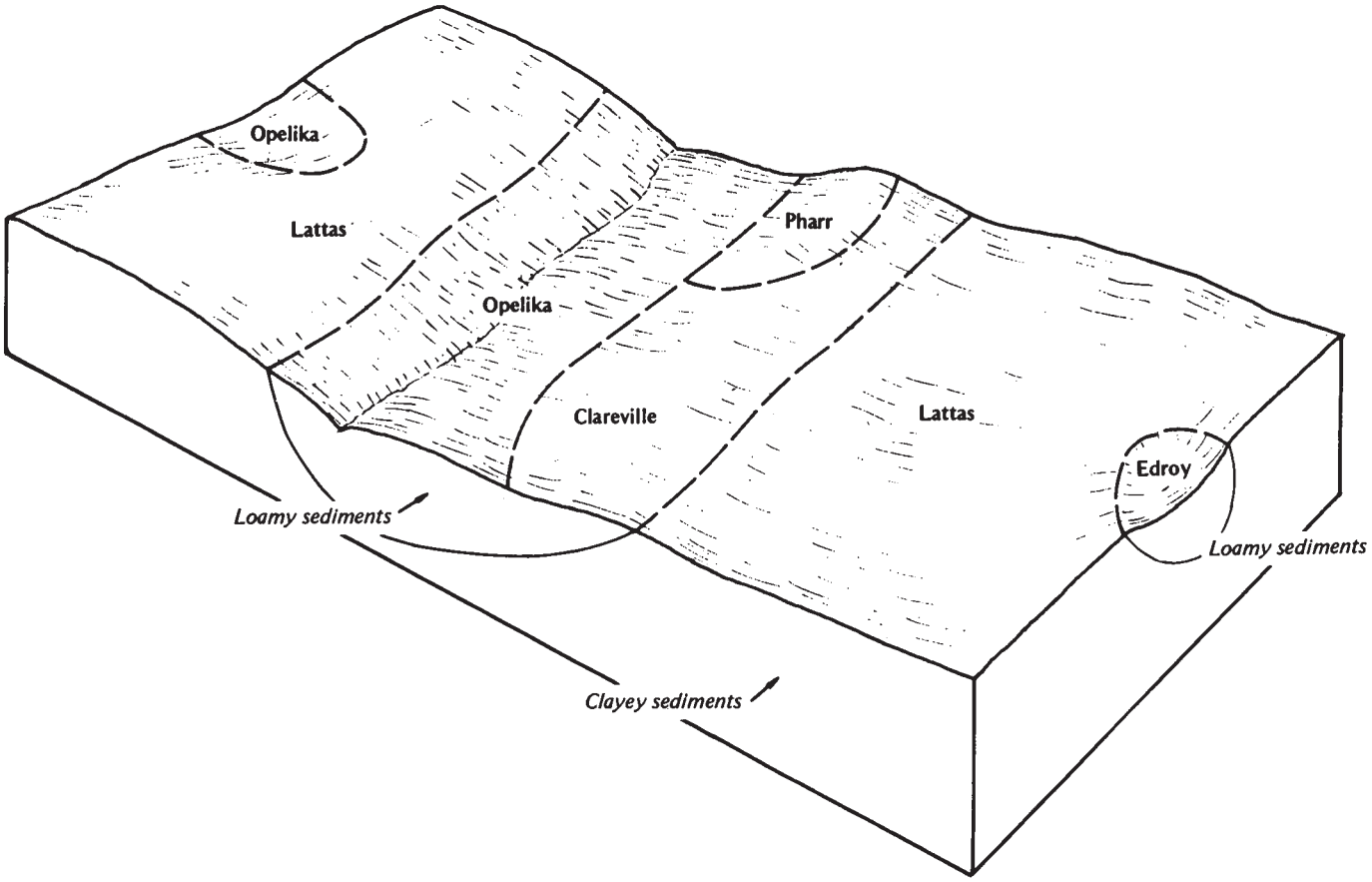


Figure 1.—Typical pattern of soils in Lattas-Opelika-Clareville map unit.

The minor soils included in the map unit are the Aransas, Czar, Edroy, and Pharr soils. The deep, clayey, nearly level Aransas soils are on bottom lands. The deep, loamy, nearly level to gently sloping Czar soils are on uplands. The deep, clayey, nearly level Edroy soils are on uplands or terraces and depressions. The deep, loamy, nearly level to gently sloping Pharr soils are on deltas or coastal terraces.

Most areas of this map unit are used as cropland, but some areas are used for improved pasture and as rangeland.

The potential for cultivated crops is high. Low rainfall is the main limitation. Cotton, grain sorghum, and flax are the main crops.

The potential for rangeland is high. Native range plants are mainly mid and tall grasses.

Because of shrinking and swelling with changes in moisture content—corrosivity to uncoated steel low strength, and moderately slow permeability, the potential for most urban uses is low.

2. Lattas

Somewhat poorly drained, very slowly permeable, clayey soils

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 3 percent. It makes up about 3 percent of the county. It is about 75 percent Lattas soils and 25 percent minor soils.

Lattas soils have a surface layer that is firm, moderately alkaline, dark gray clay about 5 inches thick. The layer below that, to a depth of 21 inches, is very firm, moderately alkaline, very dark gray clay. Below that, to a depth of 29 inches, the soil is very firm, moderately

depth of 53 inches, the soil is very firm, moderately alkaline, gray clay that has a few slickensides and a few old cracks filled with dark gray material. The underlying material, to a depth of 70 inches, is very firm, moderately alkaline, light brownish gray clay that has a few old cracks filled with dark gray material.

The minor soils included in this map unit are the Clare

Deep to shallow, nearly level to gently sloping, loamy soils on uplands

The soils in this group make up about 28 percent of the county. The major soils are Pernitas, Olmos, Pettus, Goliad, Parrita, and Lacoste soils. The surface layer of these soils is loamy, and the underlying layers are loamy or clayey. These soils are well drained or moderately

Pernitas soils have a surface layer that is about 11 inches thick. The layer is friable, moderately alkaline,

Most areas of this map unit are used as rangeland, but some areas are cultivated.

Most areas of this map unit are used as rangeland and improved pastures, but some areas are cultivated.

The potential for cultivated crops is medium. Low rainfall, the hazard of water erosion, and a cemented pan are the main limitations. Grain sorghum is the main crop.

The potential for rangeland use is medium. Native range plants are short, mid, and tall grasses.

Because of shrinking and swelling with changes in moisture content, corrosivity to uncoated steel, low strength, cemented pan, and moderate and moderately slow permeability, the potential for most urban uses is

the underlying layers are loamy or clayey. The soils are well drained to somewhat poorly drained and are moderately permeable to very slowly permeable.

Most areas of these soils are used for cultivated crops and improved pasture. Cotton, grain sorghum, and flax are the main cultivated crops. Improved pastures consist of coastal bermudagrass and buffelgrass.

The soils in this group have medium potential for urban uses and medium or high potential for recreation uses.

5. Runge-Delfina-Papalote

[illegible]

Deep, nearly level to gently sloping, loamy and sandy soils on uplands

The soils in this group make up about 45 percent of

permeable to slowly permeable, loamy soils

This map unit consists of nearly level to gently sloping soils that have slopes of 0 to 5 percent. It makes up about 17 percent of the county. It is about 37 percent Runge soils, 28 percent Delfina soils, 8 percent Papalote

sandy loam. Below that, to a depth of 18 inches, the soil is friable, neutral, reddish brown sandy clay loam. To a depth of 34 inches, it is friable, mildly alkaline, yellowish red sandy clay loam. Below that, to a depth of 55 inches, it is friable, moderately alkaline, reddish yellow sandy

The potential for rangeland is high. Native range plants are mid and tall grasses.

Because of shrinking and swelling with changes in moisture content, corrosivity to uncoated steel, low strength, and moderate to slow permeability, the poten-

moderately alkaline, reddish yellow sandy clay loam that is about 5 percent, by volume, soft masses and concretions of calcium carbonate.

6. Opelika-Delfina-Czar

Somewhat poorly drained to well drained, very slowly

terraces. The deep, loamy, nearly level to gently sloping Runge soils are on uplands and stream terraces.

Most areas of this map unit are used as cropland and improved pasture.

of 49 inches, it is firm, moderately alkaline, light brown sandy clay loam. And to a depth of 65 inches, the soil is firm, moderately alkaline, pink sandy clay loam that is about 2 to 4 percent, by volume, soft masses of calcium

alkaline, brown sandy clay loam in the lower 12 inches.

Aransas soils have a surface layer that is about 40

soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Runge fine sandy loam, 1 to 3 percent slopes, is one of 5 phases within the Runge series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil associations.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Olmos association, undulating, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or

part. Below that, to a depth of 65 inches, the soil is very firm, moderately alkaline, gray clay.

This soil is poorly drained. Runoff is very slow. Flood prevention measures and water storage structures help protect the soil from frequent flooding, but the soil is occasionally flooded following unusually heavy rainfall. When this soil is dry, cracks up to 1 inch wide form on the surface. Water enters the soil rapidly when the surface is cracked and very slowly when the surface is wet and the cracks are sealed. Permeability is very slow, and the available water capacity is medium. The root zone is deep, but clay can impede the movement of air, water, and roots. The hazard of water erosion is slight.

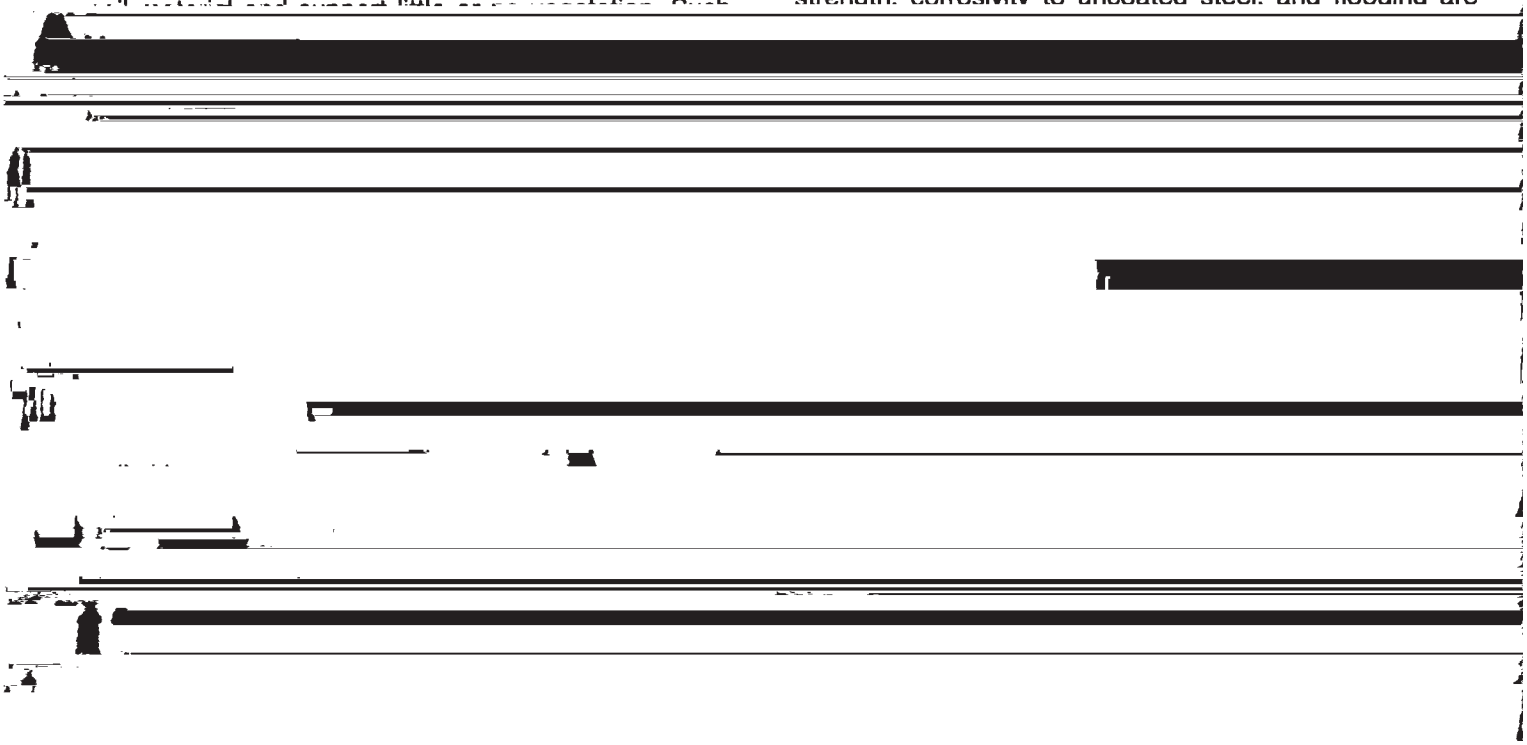
Included in mapping are small areas of Sinton and Lattas soils. Also included are areas of Aransas soils that have a loamy or sandy overwash from adjacent upland soils. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as rangeland. A few acres are in improved pasture of coastal bermudagrass.

The potential for grain sorghum and cotton is high. Cropping systems should be adapted for water management and maintenance of soil productivity and tilth. High residue producing crops are needed, and crop residue should be left on the soil surface. Grassed waterways, diversion terraces, and drainage ditches help to remove excess water.

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for urban uses is low. Shrinking and swelling of the soil with changes in moisture content, low strength, corrosivity to uncoated steel, and flooding are



hazard of water erosion is slight.

Included in mapping are small areas of Sinton and

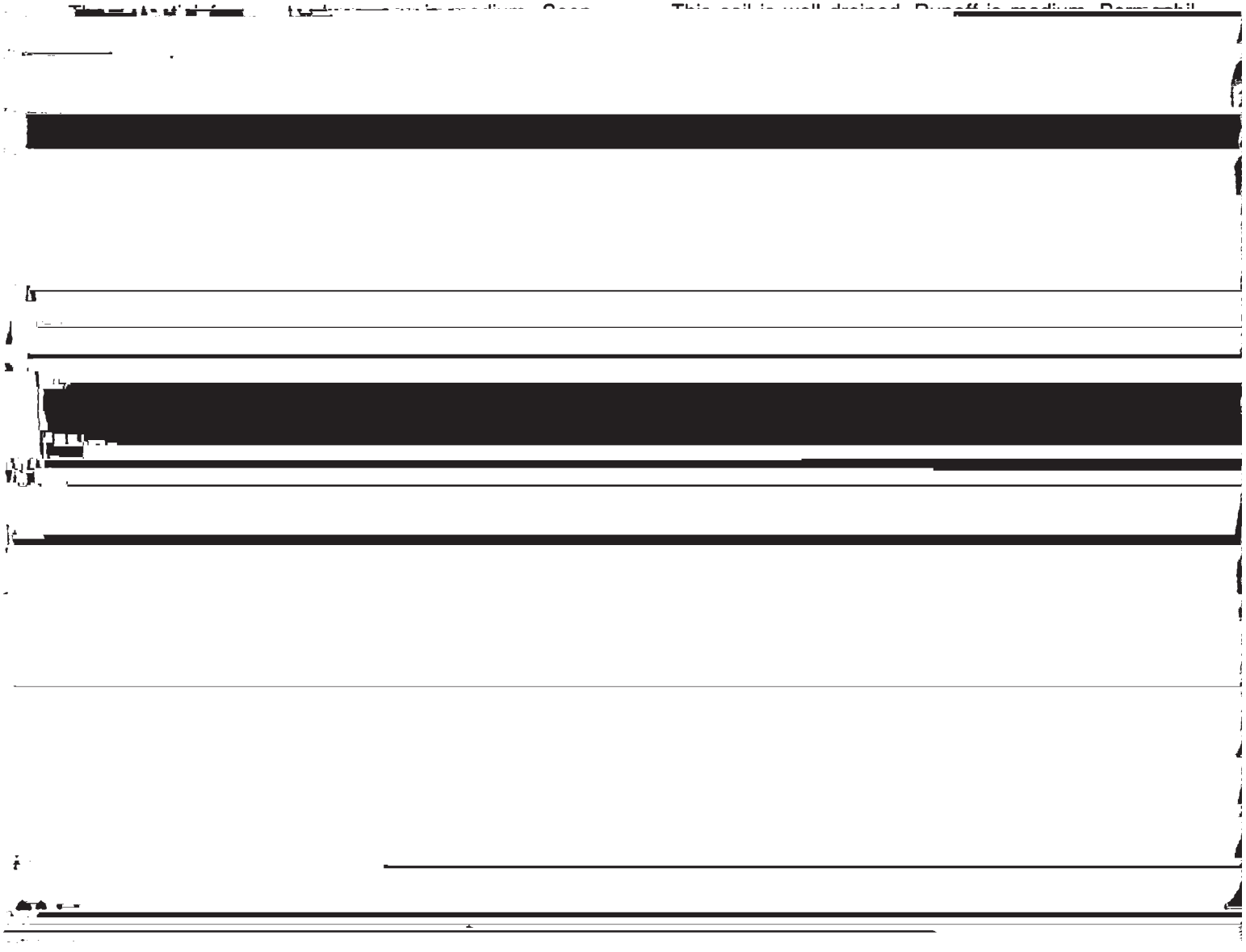
sorghum. A few areas are used as rangeland.

The potential for cotton and grain sorghum is high.

wind erosion. Grassed waterways help to reduce erosion.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

loam in the upper 9 inches and firm, moderately alkaline, brown sandy clay loam in the lower 12 inches. To a depth of 47 inches, the soil is friable, moderately alkaline, pale brown sandy clay loam. And to a depth of 68 inches, the soil is friable, moderately alkaline, very pale brown sandy clay loam.



age, low strength, and the hazard of cutbanks caving are the main limitations. The potential for recreation uses is medium.

Capability subclass IIIs; Loamy Sand range site.

5—Czar fine sandy loam, 0 to 1 percent slopes. This is a deep, nearly level soil on uplands. The surface is plane to slightly convex. Areas of this soil are irregular to oval in shape and range from 20 to 200 acres in size.

This soil has a surface layer that is about 14 inches thick. The layer is friable, dark gray fine sandy loam. It is neutral in the upper 5 inches and moderately alkaline in

ity is moderate, and the available water capacity is medium. The root zone is deep. The hazard of water erosion is moderate.

Included in mapping are small areas of Runge, Delfina, and Pharr soils and some areas of a soil that is similar to this Czar soil except that it has a dark surface layer less than 20 inches thick. Some areas have a sandy clay loam surface layer. Inclusions make up less than 15 percent of any one mapped area.

This soil is used as cropland and rangeland. Cotton and grain sorghum are the main crops.

The potential for cotton and grain sorghum is medium.

This soil is used mostly as cropland. Cotton, grain [illegible] are the main crops. A few areas are in improved pasture of coastal bermudagrass.

The potential for cotton, grain sorghum, and flax is high. A cropping system should be used that helps conserve moisture and maintain or improve soil productivity and tilth. Crops that produce much residue are needed, and the crop residue should be returned to the surface. Farming on the contour helps to conserve moisture.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture content, low strength, the hazard of cutbanks caving, and very slow permeability are the main limitations. The potential for recreation uses is low because of the clayey [illegible]

grassed waterways, and diversion terraces help to control erosion.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture content, low strength, the hazard of cutbanks caving, and the very slow permeability are the main limitations. The potential for recreation uses is low because of the clayey surface layer and the very slow permeability.

Capability subclass IIIe; Blackland range site.

9—Delfina loamy fine sand, 0 to 2 percent slopes. This is a deep, nearly level to gently sloping soil on uplands. The surface is plane to convex. Areas of this soil are oval in shape and range from 20 to several

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, low strength, seepage, and moderately slow permeability are the most limiting features. The potential for recreation uses is medium.

Capability subclass IIIe; Loamy Sand range site.

10—Delfina fine sandy loam, 0 to 1 percent slopes. This is a deep, nearly level soil on uplands. The surface is slightly convex. Areas of this soil are irregular to oval in shape and range from 15 to several hundred acres in size.

This soil has a surface layer that is about 12 inches thick. The layer is very friable, slightly acid, brown fine sandy loam. Below that, to a depth of 16 inches, the soil is firm, neutral, brown sandy clay loam. To a depth of 28 inches, it is very firm, mildly alkaline, brown sandy clay loam that is mottled in shades of red, yellow, and gray. Below that, to a depth of 36 inches, the soil is firm, moderately alkaline, light brown sandy clay loam. And to a depth of 80 inches, the soil is firm, moderately alkaline, reddish yellow sandy clay loam that is about 4 percent, by volume, soft masses and concretions of calcium carbonate.

face is convex. Areas of this soil are irregular to oval in shape and range from 10 to 200 acres in size.

This soil has a surface layer that is about 12 inches thick. The layer is very friable, neutral, brown fine sandy loam. Below that, to a depth of 15 inches, the soil is friable, neutral, brown sandy clay loam that has gray mottles. To a depth of 28 inches, the soil is firm, mildly alkaline, brown sandy clay loam that is mottled in shades of gray and brown. The layer below that, to a depth of 50 inches, is firm, moderately alkaline, pink sandy clay loam that is mottled in shades of gray and brown; in the lower 14 inches, it is about 5 percent, by volume, soft masses of calcium carbonate. And to a depth of 72 inches, the soil is firm, moderately alkaline, reddish yellow sandy clay loam.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and the available water capacity is medium. The root zone is deep, but the blocky structure of the subsoil can impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included in mapping are small areas of Opelika, Papalote, and Runge soils. Also included are areas of a soil that is similar to Delfina soils except that it has second-

loam. Below that, to a depth of 30 inches, the soil is

derlying material consists of white caliche that is strongly cemented in the upper part.

This soil is well drained. Runoff is medium. Permeability is moderate, and the available water capacity is low. The root zone is moderately deep. The hazard of erosion is moderate.

Included in mapping are small areas of Goliad, Lacoste, Papalote, and Runge soils and areas of Delmita soils that have slope of less than 1 percent. Also included are a few areas of a soil that is similar to Delmita

Included in mapping are small areas of Lattas and

is similar to Edroy soils except that it is not so deep. These inclusions make up less than 10 percent of any one mapped area.

This soil is used mostly as cropland. Cotton and grain sorghum are the main crops.

The potential for cotton and grain sorghum is medium. Soil wetness is the main problem. In most years, simple drainage practices can increase yields and expedite tillage operations. In years of above-normal rainfall, planting and tillage may be delayed. A cropping system

This soil is used mostly as rangeland. It cannot be used economically as cropland.

The potential for crops is low. Areas of this soil are generally small and difficult to drain.

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is low.

The potential for most urban uses is low. Shrinking and swelling of this soil with changes in moisture content, corrosivity to steel, very slow permeability, wetness, flooding, and low strength are the limitations. The potential for recreation uses is low because of wetness, flooding, and the clayey surface texture.

Capability subclass Vw; Lakebed range site.

15—Goliad fine sandy loam, 0 to 1 percent slopes. This is a moderately deep, nearly level soil on uplands. The surface is slightly convex. Areas of this soil are irregular to oval in shape and range from 10 to 70 acres in size.

This soil has a surface layer that is about 12 inches thick. The layer is friable, mildly alkaline, dark brown fine sandy loam. Below that, to a depth of 18 inches, the soil is friable, moderately alkaline, reddish brown sandy clay loam. To a depth of 38 inches, it is firm, moderately alkaline, yellowish red sandy clay. The underlying material consists of white, fractured, indurated caliche that has interstices filled with loamy material.

This soil is moderately well drained. Runoff is medium. Permeability is moderately slow, and the available water capacity is low. The root zone is moderately deep. The hazard of water erosion is slight.

Included in mapping are small areas of Delmita, Lacoste, Parrita, and Runge soils. Also included are small areas of a soil similar to this Goliad soil except that the are irregular in shape and range from 20 to 300 acres in size.

This soil has a surface layer that is about 9 inches thick. The layer is friable, neutral, dark grayish brown fine sandy loam. Below that, to a depth of 14 inches, the soil is friable, mildly alkaline, dark brown sandy clay loam. To a depth of 29 inches, it is firm, moderately alkaline sandy clay. It is brown in the upper 12 inches and strong brown in the lower 3 inches. The underlying material consists of white indurated caliche.

This soil is moderately well drained. Runoff is medium. Permeability is moderately slow, and the available water capacity is low. The root zone is moderately deep. The hazard of water erosion is moderate.

Included in mapping are small areas of Delmita, Lacoste, Parrita, and Runge soils and areas of Goliad soils that have slope of more than 3 percent. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as rangeland. A few areas of this soil are used as improved pasture of buffelgrass.

The potential for cotton and grain sorghum is medium. A cropping system should be used that helps control erosion and maintain or improve soil productivity and tilth. Crop residue should be returned to the surface. Terraces and contour farming are needed to control erosion and conserve moisture. Grassed waterways and diversion terraces help to reduce erosion.

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, moderately slow permeability, low strength, and a cemented pan are the limitations. The potential for recreation uses is high

This soil is used mostly as rangeland. A few areas are cultivated to grain sorghum.

The potential for cotton and grain sorghum is medium. Cropping systems should be adapted to conserve moisture and maintain or improve soil productivity and tilth. Crop residue should be returned to the surface. Contour farming helps conserve moisture.

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, moderately slow permeability, low strength, and a cemented pan are the limitations. The potential for recreation uses is medium.

Capability subclass IIs; Clay Loam range site.

18—Goliad sandy clay loam, 1 to 3 percent slopes. This is a moderately deep, gently sloping soil on uplands. The surface is slightly convex. Areas of this soil are irregular to oval in shape and range from 20 to 250 acres in size.

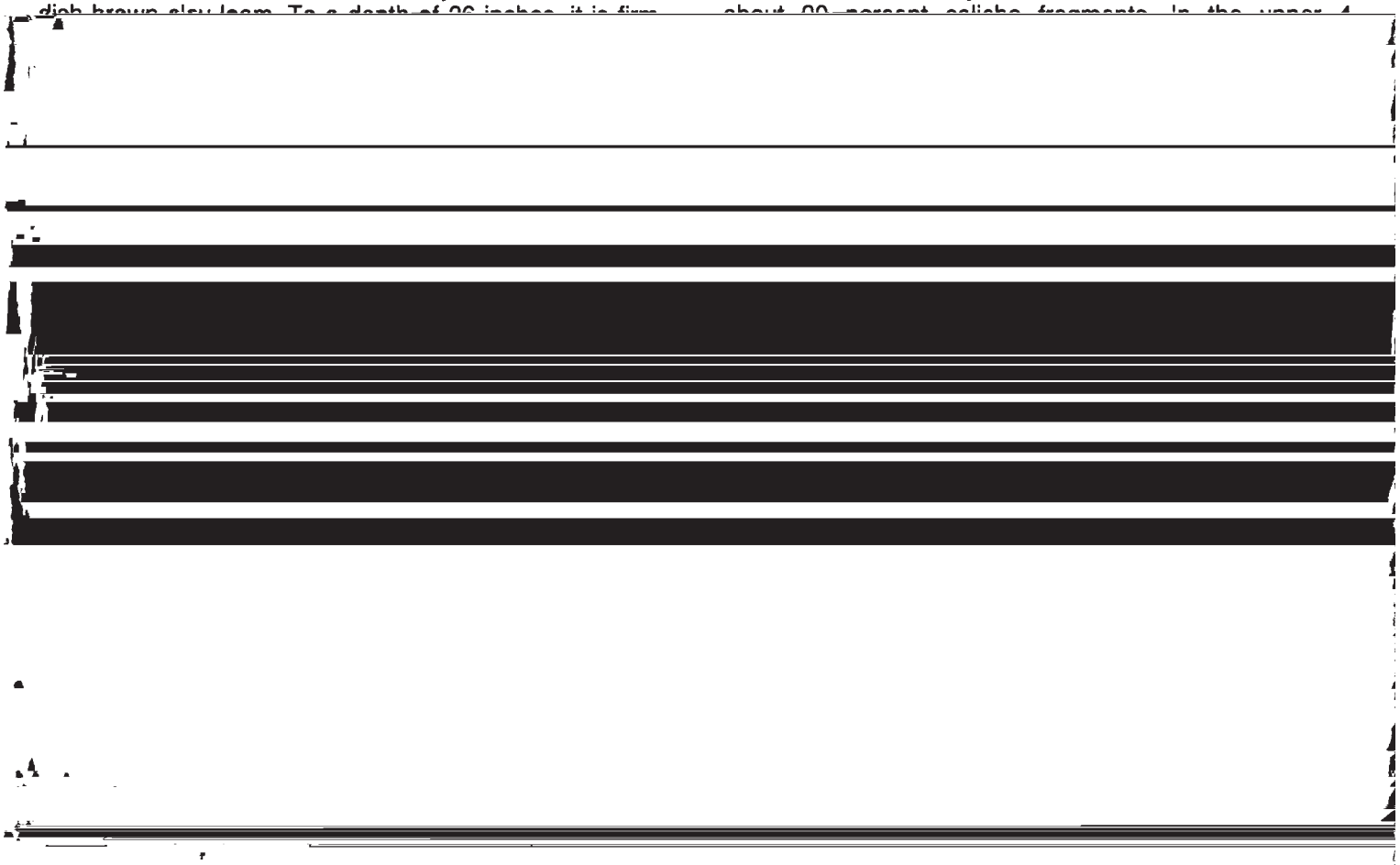
This soil has a surface layer that is about 9 inches thick. The layer is friable, moderately alkaline, dark brown sandy clay loam. Below that, to a depth of 13 inches, the soil is friable, moderately alkaline, dark reddish brown clay loam. To a depth of 26 inches, it is firm

Slopes range from 1 to 5 percent. Areas are irregular to oval in shape and range from 20 to 600 acres in size.

Lacoste soils make up about 59 percent of the association, Olmos soils about 27 percent, and minor soils about 14 percent. In some areas, the Lacoste and Olmos soils could have been mapped separately at the scale used; but these soils are similar in use and management so separation was not necessary.

Lacoste soils are on ridgetops. The surface layer is about 7 inches thick. It is very friable, mildly alkaline, brown fine sandy loam in the upper 2 inches and friable, moderately alkaline, brown fine sandy loam in the lower 5 inches. Below that, to a depth of 12 inches, the soil is friable, moderately alkaline, reddish brown sandy clay loam. The underlying material is white, strongly cemented caliche that is fractured in the upper part.

Olmos soils are on the upper part of side slopes. The surface layer is about 9 inches thick. In the upper 3 inches, it is friable, moderately alkaline, grayish brown gravelly loam that is about 3 to 5 percent concretions and fragments of calcium carbonate that are mostly less than 5 millimeters wide and about 20 percent caliche fragments. In the lower 6 inches, it is friable, moderately alkaline, grayish brown gravelly loam that is about 5 to 10 percent concretions and fragments of calcium carbonate that are mostly less than 1 centimeter wide and about 20 percent caliche fragments. In the upper 4



yields of short and mid grasses. The potential for wildlife habitat is low.

The potential for most urban uses is low. Seepage

gray clay that has a few old cracks filled with dark gray soil material.

This soil is somewhat poorly drained. Runoff is very

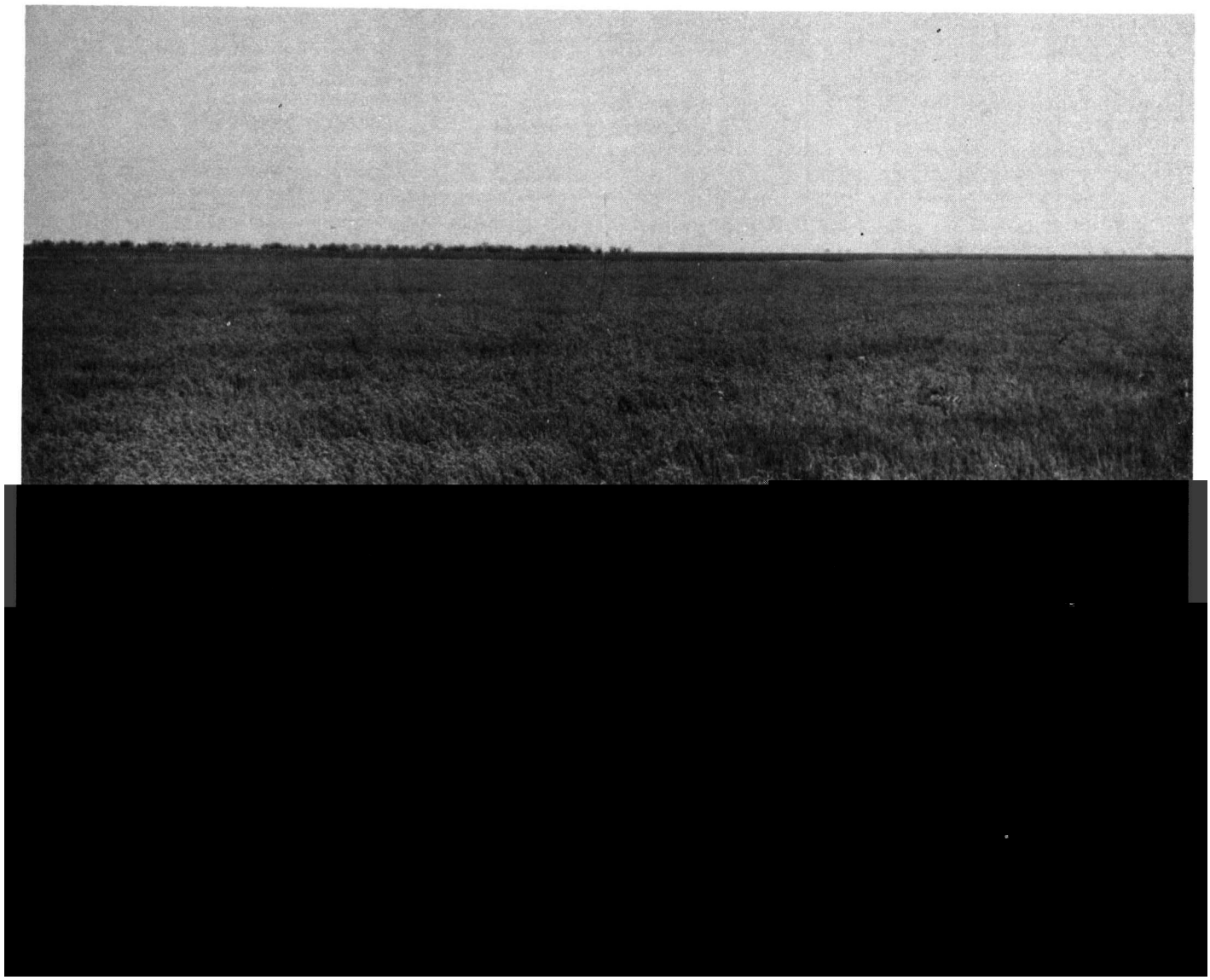


Figure 5.—Lattas clay, 0 to 1 percent slopes, has a high potential for flax.

The potential for cotton, grain sorghum, and flax is high. Because of poor drainage, crop yields are reduced in years of above-normal rainfall. Also, if cultivated when the moisture content is too high, the soil surface can become cloddy. A cropping system should be used that helps conserve moisture and maintain or improve soil productivity and tilth. Crops that produce a large amount of residue should be used. Residue returned to the surface helps conserve moisture, prevent crusting, and improve tilth. Drainage ditches can help remove excess water in years of abnormally high rainfall. Land smoothing generally is necessary.

The potential for native range plants is medium. In favorable years this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is low. Shrinking and swelling of the soil, corrosivity to steel, low strength, and very slow permeability are the limitations. The potential for recreation uses is low. The clayey surface layer limits the use of this soil.

Capability subclass IIIs; Blackland range site.

21—Lattas clay, 1 to 3 percent slopes. This is a deep, gently sloping soil on uplands. The surface is slightly convex. Areas of this soil are irregular to oval in shape and range from 30 to 250 acres in size.

This soil has a surface layer that is about 16 inches thick. The layer is friable, moderately alkaline, dark gray clay in the upper 6 inches and firm, moderately alkaline,

very dark gray clay that has a few slickensides in the lower 10 inches. The layer below that, to a depth of 42 inches, is firm, moderately alkaline clay; it is dark gray and gray in the upper 12 inches and light brownish gray in the lower 14 inches. To a depth of 65 inches, the soil is firm, moderately alkaline, light gray clay.

This soil is somewhat poorly drained. Runoff is slow. When this soil is dry, cracks up to 1 1/2 inches wide

inches; and firm, mildly alkaline, light gray sandy clay loam that has brownish mottles in the lower 8 inches. To a depth of 65 inches, the soil is friable, moderately alkaline, very pale brown sandy clay loam that is about 5 to 10 percent soft masses and concretions of calcium carbonate.

This soil is moderately well drained to somewhat poorly drained. Runoff is slow. Permeability is slow, and

Included in mapping are small areas of Opelika, Papalote, and Runge soils and small areas of a Miguel soil that has a loamy fine sand surface layer. Also included are areas of a soil that is similar to this Miguel soil except that it has secondary carbonates at a depth of less than 28 inches. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as rangeland and improved pasture of coastal bermudagrass.

The potential for cotton and grain sorghum is low. Cropping systems should be adapted to control erosion and maintain or improve soil productivity and tilth. Crop residue returned to the surface helps prevent erosion and improve tilth. Terraces and contour farming help to reduce erosion. Grassed waterways and diversion terraces help remove excess water during heavy rains.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, and very slow permeability are the limitations. The potential for recreation uses is medium because of very slow permeability.

Capability subclass IIIe; Tight Sandy Loam range site.

24—Odem fine sandy loam. This is a deep, nearly level soil on flood plains. The surface is plane to slightly convex. Slopes range from 0 to 1 percent. Areas of this soil are irregular to oblong in shape and range from 20 to 80 acres in size.

This soil has a surface layer that is about 46 inches thick (fig. 6). The layer is friable, moderately alkaline fine sandy loam that is grayish brown in the upper 6 inches and dark grayish brown in the lower 40 inches. Below that, to a depth of 72 inches, the soil is friable, moderately alkaline, light brownish gray fine sandy loam.

This soil is moderately well drained to well drained. Runoff is slow. Permeability is moderately rapid, and the available water capacity is medium. The root zone is deep and is easily penetrated by plant roots. The hazard of water erosion is slight.

Included in mapping are small areas of Opelika, Papagua, and Sinton soils. These inclusions make up less than 15 percent of any one mapped area.

This soil is used as cropland, rangeland, and improved pasture of buffelgrass or coastal bermudagrass.

The potential is medium for cotton and high for grain sorghum. Cropping systems should be adapted for water management and to control moisture and maintain or improve soil productivity and tilth. Crop residue should be returned to the soil surface.

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is low. Flooding and seepage are the limitations. The potential for recreation uses is medium because of flooding.

Capability subclass IIc; Loamy Bottomland range site.

Figure 6.—Profile of Odem fine sandy loam.

25—Oil-Waste land. Oil-Waste land consists of small areas of different kinds of soils that have been affected by oil-field activity. Vegetation is sparse and of poor quality. These areas range from 3 to 15 acres in size.

The soils have been damaged by heavy machinery and by the addition of oil derivatives and by-products such as brine, drilling mud, and sludge.

This map unit does not include small reservoirs that are used to contain oil or oil waste products. These reservoirs are generally less than 2 acres in size and are easily identified by photo interpretation.

The productivity of these soils is drastically reduced or destroyed depending on the kind and amount of damage received and the length of time the soil is exposed to the damaging agent.

The potential is low for any use that requires vegetation.

Capability subclass not assigned.

26—Olmos association, undulating. The soils in this association are on uplands. The surface is convex. Slopes range from 1 to 8 percent. Areas are irregular, oval, or oblong in shape and range from 20 to several hundred acres in size.

This association is made up of about 72 percent Olmos soils and similar soils and 28 percent other soils. The areas of this map unit are much larger than those of other map units in the county, and the composition is more variable. Mapping has been controlled for the anticipated use of the areas.

Olmos soils are on ridgetops and upper side slopes. They have a surface layer that is about 9 inches thick. The layer, in the upper 3 inches, is friable, moderately alkaline, grayish brown gravelly loam that is about 3 to 5 percent concretions and fragments of calcium carbonate mostly less than 5 millimeters wide and about 20 percent caliche fragments. In the lower 6 inches it is friable, moderately alkaline, grayish brown gravelly loam that is about 5 to 10 percent concretions and fragments of calcium carbonate mostly less than 1 centimeter wide and about 30 percent caliche fragments. The underlying material, in the upper 4 inches, is white and pink, strongly cemented, laminar caliche that has solution channels filled with gray and dark gray material. Below that, it is white, weakly cemented, nodular caliche that has interstices filled with light brownish gray loamy material (fig. 7).

The soils in this association are well drained. Runoff is medium. Permeability is moderate, and the available water capacity is very low. The root zone is shallow. The hazard of water erosion is moderate to severe.

Included in mapping are small areas of Goliad, Lacoste, Parrita, Pernitas, and Pettus soils and a few eroded areas where the caliche is at or near the surface. Also included is a soil that is similar to Olmos soils except that it has a lighter colored surface layer. Included soils make up about 28 percent of any mapped area.

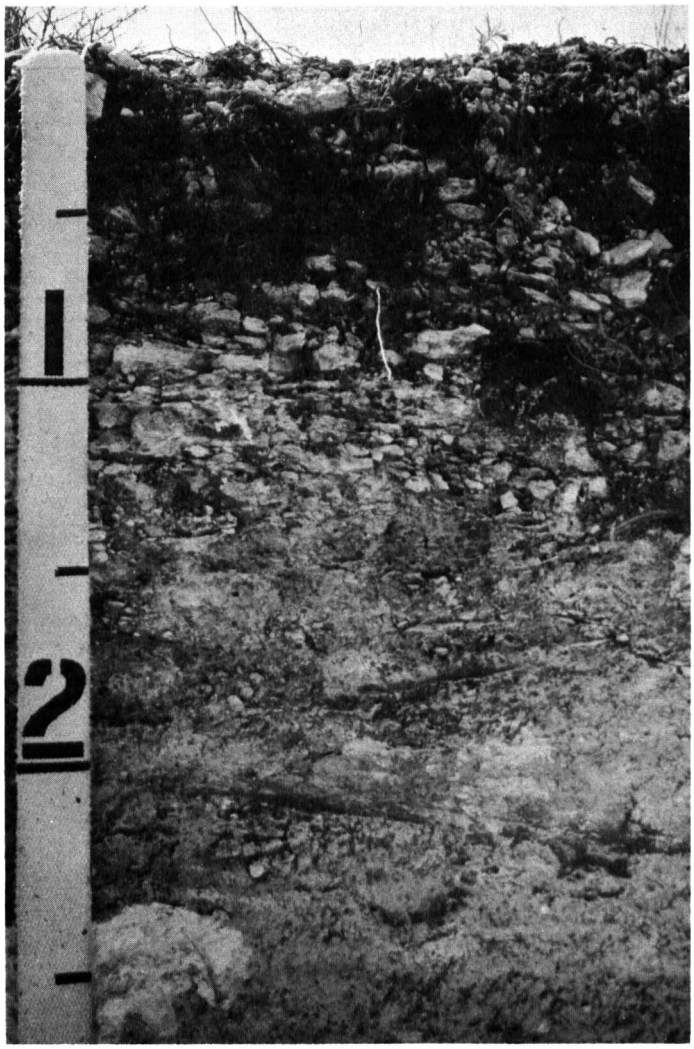
of slope, shallow rooting depth, susceptibility to water erosion, and very low available water capacity. This association is not suited to use as cropland.

The potential for native range plants is low. In favorable years, this association produces low yields of short and mid grasses. The potential for wildlife habitat is low.

The potential for most urban uses is low. Seepage, corrosivity to steel, and a cemented pan are the limitations. Because of stoniness, the potential for recreation uses is low.

Capability subclass VIIs; Shallow Ridge range site.

27—Opelika fine sandy loam. This is a deep, nearly level soil on uplands. The surface is plane to slightly concave. Slopes range from 0 to 1 percent. Areas are irregular to oblong in shape and range from 4 to 400 acres in size.



This soil has a surface layer that is about 4 inches thick. The layer is friable, neutral, gray fine sandy loam. Below that, to a depth of 10 inches, the soil is firm, mildly alkaline, dark gray sandy clay. To a depth of 19 inches, it is firm, moderately alkaline, dark gray sandy

overflow from narrow stream channels during heavy rainfall. Permeability is very slow, and the available water capacity is medium. The root zone is deep, but the blocky structure of the subsoil can impede the move-

water capacity is medium. The root zone is deep, but the blocky structure of the subsoil can impede the movement of air, water, and roots. The hazard of water erosion is slight.

Included in mapping are small areas of Delfina, Edroy, Leming, Opelika, and Papalote soils. A few areas of Papagua soils are covered by a layer of outwash that is less than 6 inches thick. The included soils make up as much as 40 percent of some mapped areas, but generally they make up less than 20 percent.

The soils in this map unit are used mostly as rangeland and improved pasture of buffelgrass and coastal bermudagrass. In a few areas, they are cultivated to grain sorghum.

The potential for cotton and grain sorghum is medium. A cropping system should be used that helps to conserve moisture and maintain or improve soil productivity and tilth. Crop residue returned to the surface helps prevent erosion and conserve moisture. Grassed waterways, diversion terraces, field ditch drains, and lateral drains are needed to control excess water during heavy

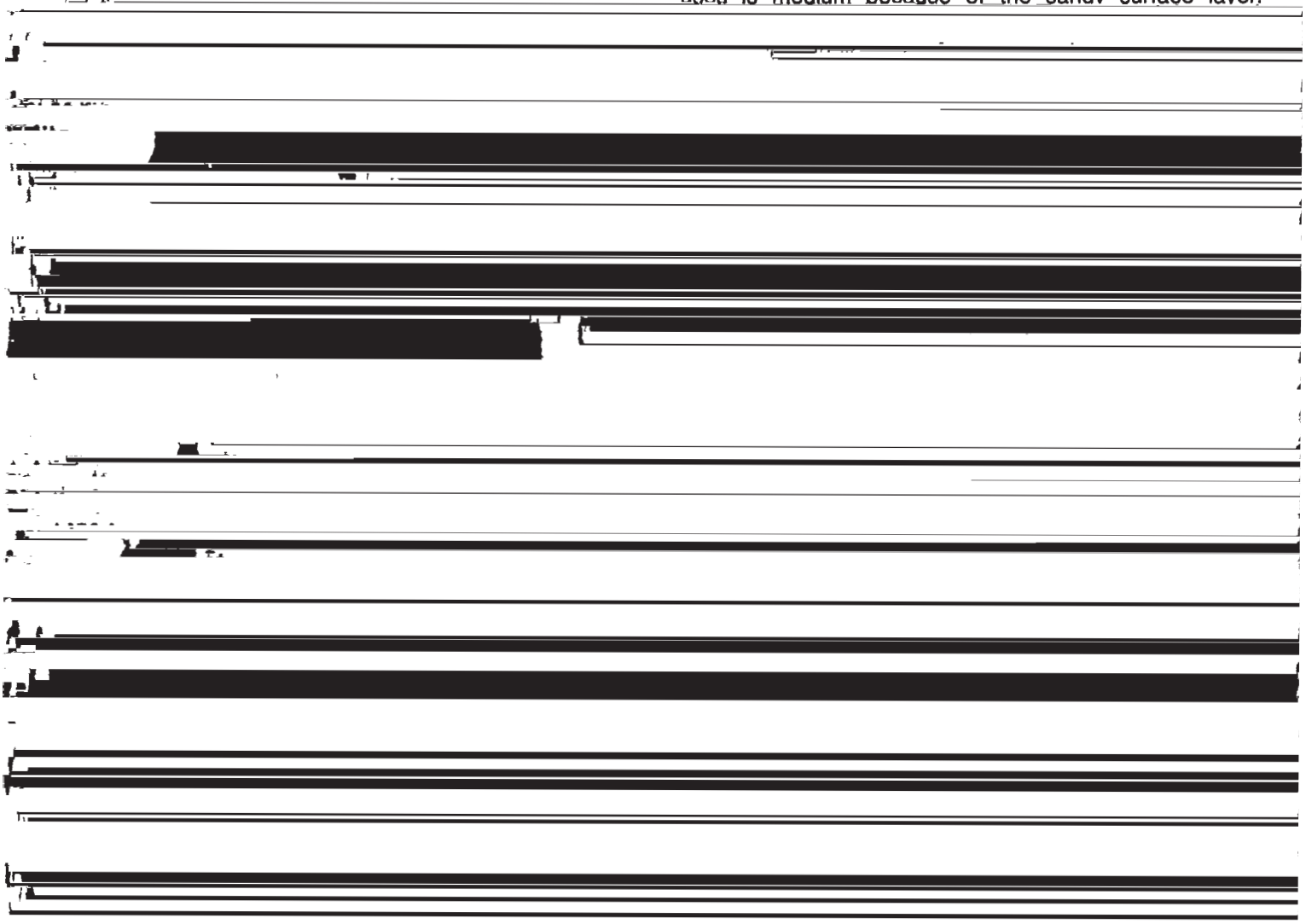
Included in mapping are small areas of Comitas, Delfina, Leming, Opelika, and Runge soils. These inclusions make up less than 15 percent of any one mapped area.

This soil is used as rangeland, cropland, and improved pasture of buffelgrass and coastal bermudagrass. Peanuts, watermelons, and grain sorghum are the main crops.

The potential for cotton and grain sorghum is medium. A cropping system should be used that helps control erosion and improve or maintain soil productivity and tilth. Crop residue should be returned to the surface. Stripcropping can help control wind erosion. Grassed waterways help to remove excess water.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Shrinking and swelling of the soils with changes in moisture content, corrosivity to steel, slow permeability, and low strength are the limitations. The potential for recreation uses is medium because of the sandy surface layer.



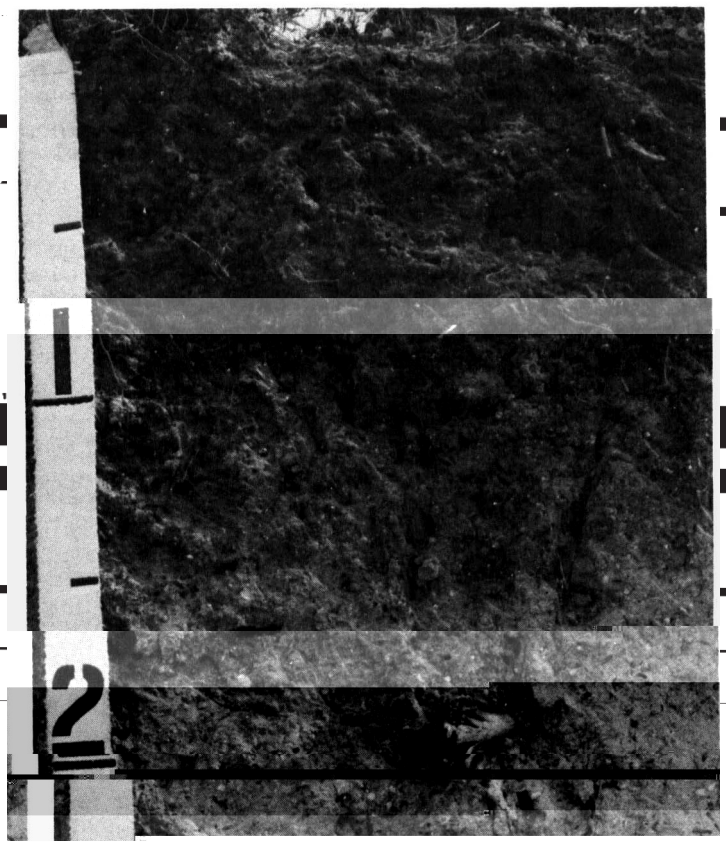
soil should be used. Crop residue should be returned to the soil surface. Contour farming helps conserve moisture. Grassed waterways and diversion terraces help to remove excess water.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, slow permeability, and low

33—Pernitas fine sandy loam, 1 to 5 percent slopes. This is a deep, nearly level to gently sloping soil on uplands. The surface is convex. Areas are irregular to oval in shape and range from 8 to 250 acres in size.

This soil has a surface layer that is about 10 inches thick (fig. 8). The layer is friable, moderately alkaline, dark grayish brown fine sandy loam. The layer below that extends to a depth of 28 inches. It is friable, moderately alkaline sandy clay loam that is dark brown in the upper 5 inches and pale brown in the lower 13 inches. To a depth of 44 inches, the soil is friable, moderately alkaline, pale brown sandy clay loam that is about 20 to 25



13 inches. To a depth of 72 inches, the soil is friable, moderately alkaline clay loam that is light brown and is about 20 to 25 percent, by volume, soft masses and concretions of calcium carbonate in the upper 6 inches and pinkish gray and about 15 to 20 percent, by volume, soft masses of calcium carbonate in the lower 36 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and the available water capacity is medium. The root zone is deep. The hazard of water erosion is slight.

Included in mapping are small areas of Olmos, Runge, Pettus, and Pharr soils. Also included are areas of a soil that is similar to Pernitas soils except that the surface layer is noncalcareous. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as cropland and rangeland. Grain sorghum and flax are the main crops.

The potential for cotton, grain sorghum, and flax is medium. A cropping system should be used that helps conserve moisture and maintain or improve soil productivity and tilth. Contour farming and crop residue returned to the surface help conserve moisture and prevent erosion. Grassed waterways and diversion terraces may be needed to help control runoff.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, seepage, and low strength are the limitations. The potential for recreation uses is medium because the surface texture is too clayey.

This soil is used mostly as rangeland. It is erodible if disturbed, and it is droughty.

The potential for cotton and grain sorghum is low. A cropping system should be used that helps control erosion and maintain or improve soil productivity and tilth. Crops that produce much residue are needed. Residue returned to the surface helps increase the water intake rate and helps prevent erosion. Terraces and contour farming are needed. Grassed waterways and diversion terraces help to control erosion.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture

The potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture content, corrosivity to steel, seepage, and low strength are the limitations. The potential for recreation uses is medium because the surface layer is too clayey.

Capability subclass VIe; Gray Sandy Loam range site.

37—Pettus sandy clay loam, 0 to 3 percent slopes. This is a shallow, nearly level to gently sloping soil on uplands. The surface is slightly concave to slightly convex. Areas are irregular to oval in shape and range from 5 to 75 acres in size.

This soil has a surface layer that is about 10 inches thick. The layer is very friable, moderately alkaline, grayish brown sandy clay loam. Below that, to a depth of 17 inches, the soil is friable, moderately alkaline, light

surface is convex. Areas are irregular to oblong in shape and range from 10 to 150 acres in size.

This soil has a surface layer that is about 8 inches thick. The layer is friable, moderately alkaline, dark brown sandy clay loam. Below that, to a depth of 14 inches, the soil is friable, moderately alkaline, grayish brown sandy clay loam. The underlying material in the upper 4 inches is white, moderately cemented caliche; below that, it is weakly cemented, fractured caliche.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is very low. The root zone is shallow. The hazard of water erosion is moderate.

Included in mapping are small areas of Olmos and clay loam that is about 20 percent, by volume, concretions of calcium carbonate up to 3 centimeters wide.

This soil is well drained. Runoff is medium. Permeability is moderate, and the available water capacity is very low. The root zone is shallow. The hazard of water erosion is moderate to severe. Sheet and gully erosion have altered 25 to 50 percent of the soil area, leaving remnants of the Pettus soil. These areas commonly do not have any vegetation, and the soil surface is partly covered by concretions of calcium carbonate, most of which are less than 2 centimeters wide.

Included in mapping are small areas of eroded Olmos, Pernitas, and Pharr soils. These inclusions make up less

The potential for cotton and grain sorghum is high. A cropping system should be used that helps conserve moisture and maintain or improve soil productivity and tilth. Crops that produce much residue should be used. Crop residue returned to the surface helps reduce soil temperatures and slow the loss of water by evaporation. Grassed waterways and diversion terraces help to control excess water. Contour farming helps conserve moisture and prevent erosion.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is high. Corrosivity to steel, seepage, and low strength are the limitations. The potential for recreation uses is high.

Capability subclass IIe; Gray Sandy Loam range site.

43—Pharr sandy clay loam, 1 to 3 percent slopes. This is a deep, gently sloping soil on uplands. The surface is slightly convex. Areas are irregular to oblong in shape and range from 5 to 100 acres in size.

This soil has a surface layer that is about 15 inches thick. The layer is very friable, moderately alkaline, dark grayish brown sandy clay loam. Below that, to a depth of 33 inches, the soil is friable, moderately alkaline, grayish brown sandy clay loam. To a depth of 44 inches, the soil is friable, moderately alkaline, pale brown sandy clay loam. And to a depth of 60 inches, the soil is friable, moderately alkaline, pale brown sandy clay loam that is about 3 to 6 percent, by volume, soft masses and concretions of calcium carbonate.

This soil is well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high. The root zone is deep. The hazard of water erosion is slight. This soil receives runoff from soils on adjacent uplands in most years and is occasionally flooded during heavy rainfall.

44—Pharr sandy clay loam, 3 to 5 percent slopes. This is a deep, gently sloping soil on uplands. The surface is slightly concave. Areas are irregular to oblong in shape and range from 20 to 150 acres in size.

This soil has a surface layer that is about 11 inches thick. The layer is friable, neutral, very dark gray sandy clay loam. The layer below that, to a depth of 41 inches, is firm, neutral sandy clay loam; it is dark grayish brown in the upper 12 inches and brown in the lower 18 inches. To a depth of 76 inches, the soil is firm, moderately alkaline, light brown sandy clay loam.

This soil is well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high. The root zone is deep. The hazard of water erosion is slight. This soil receives runoff from soils on adjacent uplands in most years and is occasionally flooded during heavy rainfall.

The root zone is deep. The hazard of water erosion is slight.

Included in mapping are small areas of Czar, Delfina, and Racombes soils and areas of Runge soils that have slopes of more than 1 percent. Also included are areas of a soil that is similar to this Runge soil except that the subsoil has gray mottles. These inclusions make up less than 15 percent of any one mapped area.

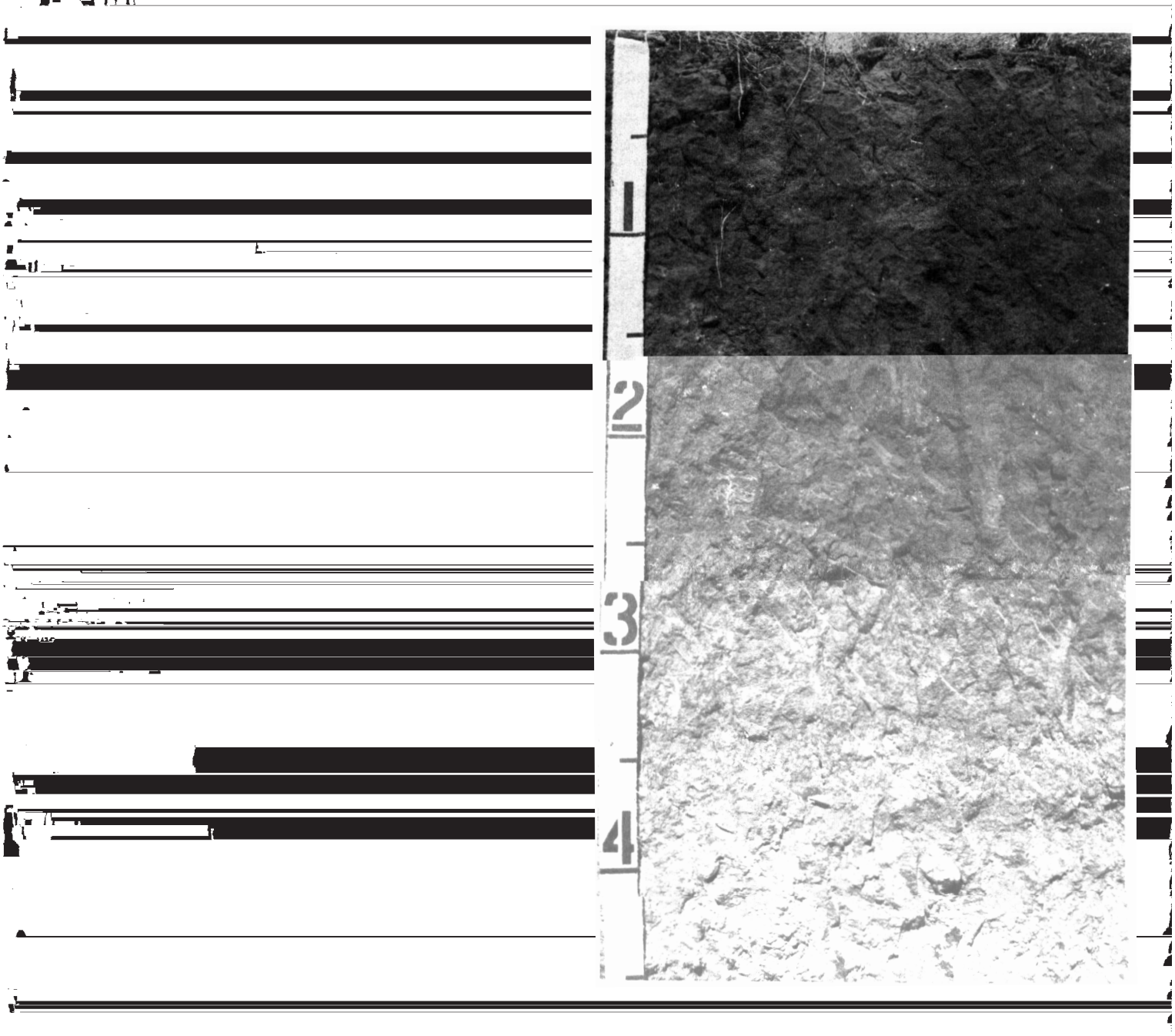
This soil is used mostly as rangeland. In a few areas it is cultivated to cotton and grain sorghum.

The potential for cotton is medium, and the potential for grain sorghum is high. A cropping system should be

tilth. Crops that produce much residue are needed. Residue should be returned to the surface. Terraces and contour farming help conserve moisture and prevent erosion. Grassed waterways and diversion terraces help to control erosion.

The potential for native range plants is medium. In favorable years, this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Corrosivity to steel, the shrink-swell potential, and low strength



prove soil productivity and tilth. Crops that

are the limitations. The potential for recreation uses is high.

Capability subclass IIe; Sandy Loam range site.

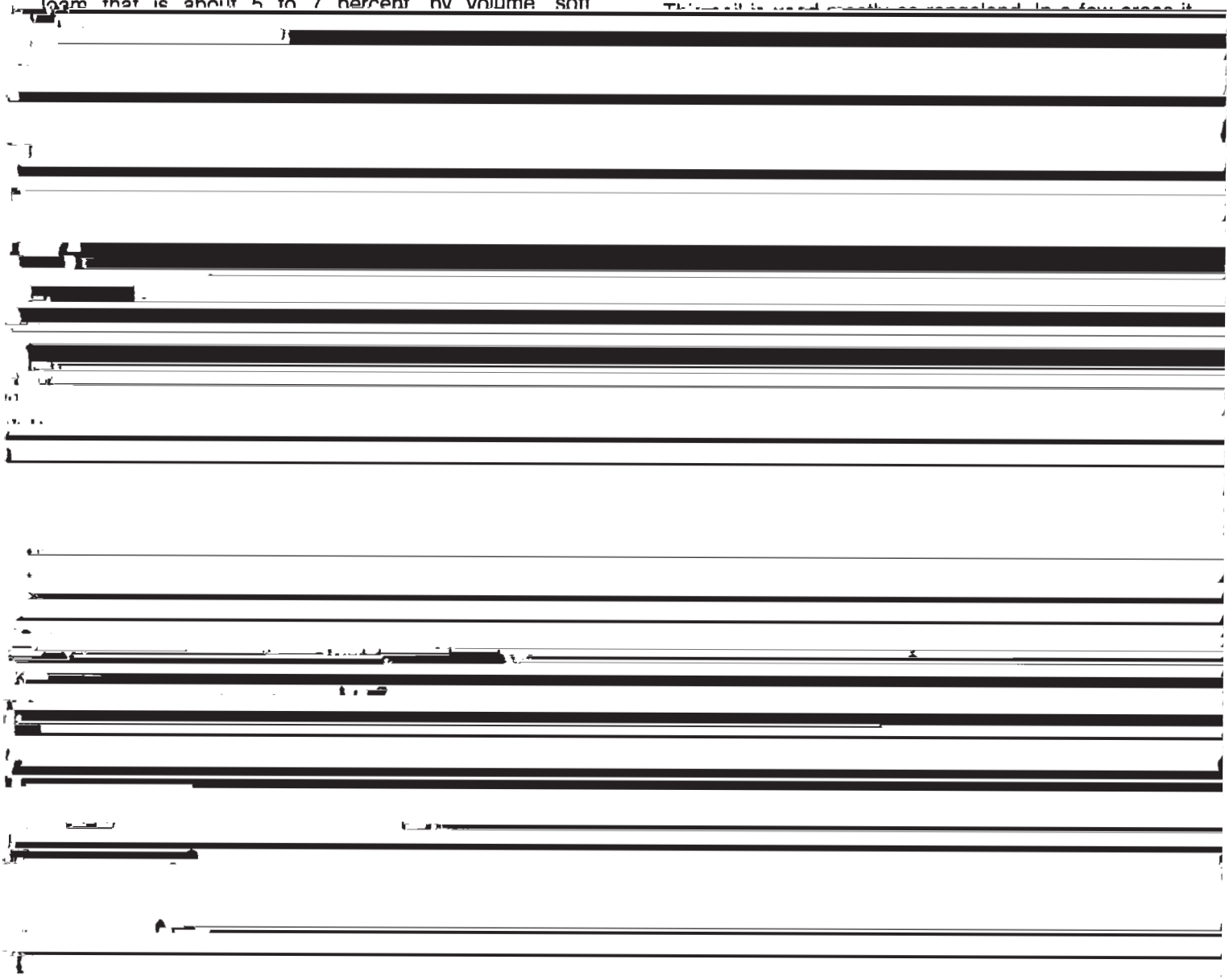
48—Runge fine sandy loam, 3 to 5 percent slopes. This is a deep, gently sloping soil on uplands. The surface is convex. Areas are oval in shape and range from 7 to 45 acres in size.

This soil has a surface layer about 12 inches thick. It is very friable, slightly acid, brown fine sandy loam. Below that, to a depth of 19 inches, the soil is very friable, neutral, reddish brown sandy clay loam. To a depth of 35 inches, it is friable, mildly alkaline, yellowish red sandy clay loam. Below that, to a depth of 50 inches, it is friable, moderately alkaline, reddish yellow sandy clay loam. And to a depth of 75 inches, the soil is friable, moderately alkaline, pink and light brown sandy clay loam that is about 5 to 7 percent, by volume, soft

loam that is dark brown in the upper 7 inches and yellowish red in the lower 19 inches. The layer between depths of 38 and 70 inches is friable, moderately alkaline sandy clay loam; it is brown and 25 to 50 percent, by volume, soft masses and concretions of calcium carbonate in the upper 15 inches; and it is pink and about 30 percent, by volume, soft masses and concretions of calcium carbonate in the lower 17 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and the available water capacity is high. The root zone is deep. The hazard of water erosion is slight.

Included in mapping are small areas of Goliad, Parrita, Pernitas, and Pharr soils. Also included are areas of a soil that is similar to this Runge soil except that the subsoil has gray mottles. These inclusions make up less than 15 percent of any one mapped area.



Included in mapping are small areas of Goliad, Parrita, Pernitas, and Pharr soils. Also included are areas of a soil that is similar to this Runge soil except that the subsoil has gray mottles. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as rangeland. In a few areas it is used as improved pasture of buffelgrass.

The potential for cotton and grain sorghum is medium. A cropping system should be used that helps control erosion and maintain or improve soil productivity and tilth. Crops that produce much residue should be used in the cropping system. Residue should be returned to the surface. Terraces and contour farming help control erosion. Grassed waterways are needed to help control erosion.

The potential for native range plants is medium. In favorable years this soil produces moderate yields of mid and tall grasses. The potential for wildlife habitat is high.

The potential for most urban uses is medium. Corrosivity to steel, the shrink-swell potential, and low strength are the limitations. The potential for recreation uses is medium because the surface texture is too clayey.

Capability subclass IIe; Sandy Loam range site.

51—Sarita loamy fine sand, 0 to 5 percent slopes. This is a deep, nearly level to gently sloping soil on uplands. The surface is concave to convex. Areas are oval to oblong in shape and range from 30 to 250 acres in size.

This soil has a surface layer that is about 63 inches thick. The layer is very friable, neutral, light brownish gray loamy fine sand in the upper 9 inches and very friable, neutral, pale brown fine sand in the lower 54

The potential for native range plants is high. In favorable years, this soil produces good yields of mid and tall grasses. The potential for wildlife habitat is medium.

The potential for most urban uses is medium. Moderately rapid permeability, low strength, corrosivity to steel, and the hazard of cutbanks caving are the limitations. The potential for recreation uses is low because of the sandy surface.

Capability subclass IVe; Sandy range site.

52—Sinton sandy clay loam. This is a deep, nearly level soil on flood plains. The surface is slightly concave. Slopes range from 0 to 1 percent. Areas of the soil are irregular in shape and range from 15 to 300 acres in size.

This soil has a surface layer that is about 34 inches thick. The layer is friable, moderately alkaline sandy clay loam that is very dark gray in the upper 10 inches and dark gray in the lower 24 inches. Below that, to a depth of 65 inches, the soil is friable, moderately alkaline, stratified sandy clay loam that is light brownish gray in the upper 16 inches and light gray in the lower 15 inches.

This soil is well drained. Runoff is slow. Permeability is moderate, and the available water capacity is medium. The root zone is deep. The hazard of water erosion is slight. This soil is commonly flooded for brief periods following heavy rains, mainly in spring and fall.

Included in mapping are small areas of Aransas, Czar, Pharr, and Racombes soils. These inclusions make up less than 15 percent of any one mapped area.

This soil is used mostly as rangeland. It should not be used as cropland because of the flood hazard.

potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops, pasture, and rangeland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the

In 1967, more than 218,000 acres in the survey area was used for crops and pasture. Of this total, 104,000 acres was used for permanent pasture; 91,000 acres, for row crops, mainly grain sorghum; 10,000 acres, for close-grown crops, mainly flax; and 13,000 acres, for rotation hay and pasture.

About 50,000 acres of soils that have good potential for use as cropland is currently used for pasture. Food production could be increased considerably by using this reserve productive capacity and by extending the lastest crop production technology to all cropland in the survey area.

Acreage in crops and pasture has gradually been decreasing as more land is used for urban development. In 1967, an estimated 14,000 acres was urban and built-up land. The use of this soil survey to help make decisions on land use in the county is discussed in the section "Soil maps for general planning."

The main management concern in Jim Wells County is the hazard of water erosion. Water erosion is a hazard on the loamy and clayey, gently sloping Czar, Danjer, Delfina, Delmita, Goliad, Lacoste, Lattas, Miguel, Papalote, Pernitas, Pettus, Pharr, and Runge soils. Vegetative cover, contour farming, terraces, and grassed waterways can help minimize water erosion on these soils.

Loss of the surface layer through erosion is damaging to the soil because productivity is reduced as the surface layer is lost and part of the subsoil is mixed into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, for example, Leming, Miguel, and Papalote soils, and on soils that have a layer in or below the subsoil that limits the depth of the root zone. For example, the Delmita, Goliad, Lacoste, Olmos, Parrita, and Pettus soils have an indurated caliche layer.

Erosion also reduces productivity on soils that tend to be droughty, for example, Delmita, Goliad, Lacoste, Olmos, Parrita, and Pettus soils.

Water erosion on farmland also causes sediment to enter streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of

Goliad, Lattas, Miguel, Papalote, Pernitas, Pettus, Pharr, and Runge soils.

[redacted]

Irrigation

In 1974, about 3,000 acres of cropland and 3,200

the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope

and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 7. All soils in the survey area

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. The relationship between soils and vegetation was established during the survey; thus range sites generally can be determined directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant

In the northeastern part of the county, most of the soils are clay loam, gravelly loam, sandy clay loam, and sandy loam that are shallow to moderately deep over indurated caliche. In a favorable year, the shallow soils produce low to moderate yields of short and mid grasses, and the moderately deep soils produce moderate to high yields of mid and tall grasses. The production potential of the shallow soils is limited because of the shallow root zone and the low available water capacity.

In the west-central part of the county, most of the soils are deep fine sandy loam and sandy clay loam. These soils produce moderate yields of mid and tall grasses in a favorable year. The production potential of these soils is limited by a medium available water capacity.

In the southeastern part of the county, most of the

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engi-

Building site development

The degree and kind of soil limitation that affects shallow excavations, dwellings with and without a basement, small commercial buildings, and local roads and streets

flexible or rigid surface, commonly asphalt or concrete. On many of the soils that have moderate or severe

suitable for growing plants. Of all the horizons, the A *good* or *fair* has a layer of suitable material at least 3

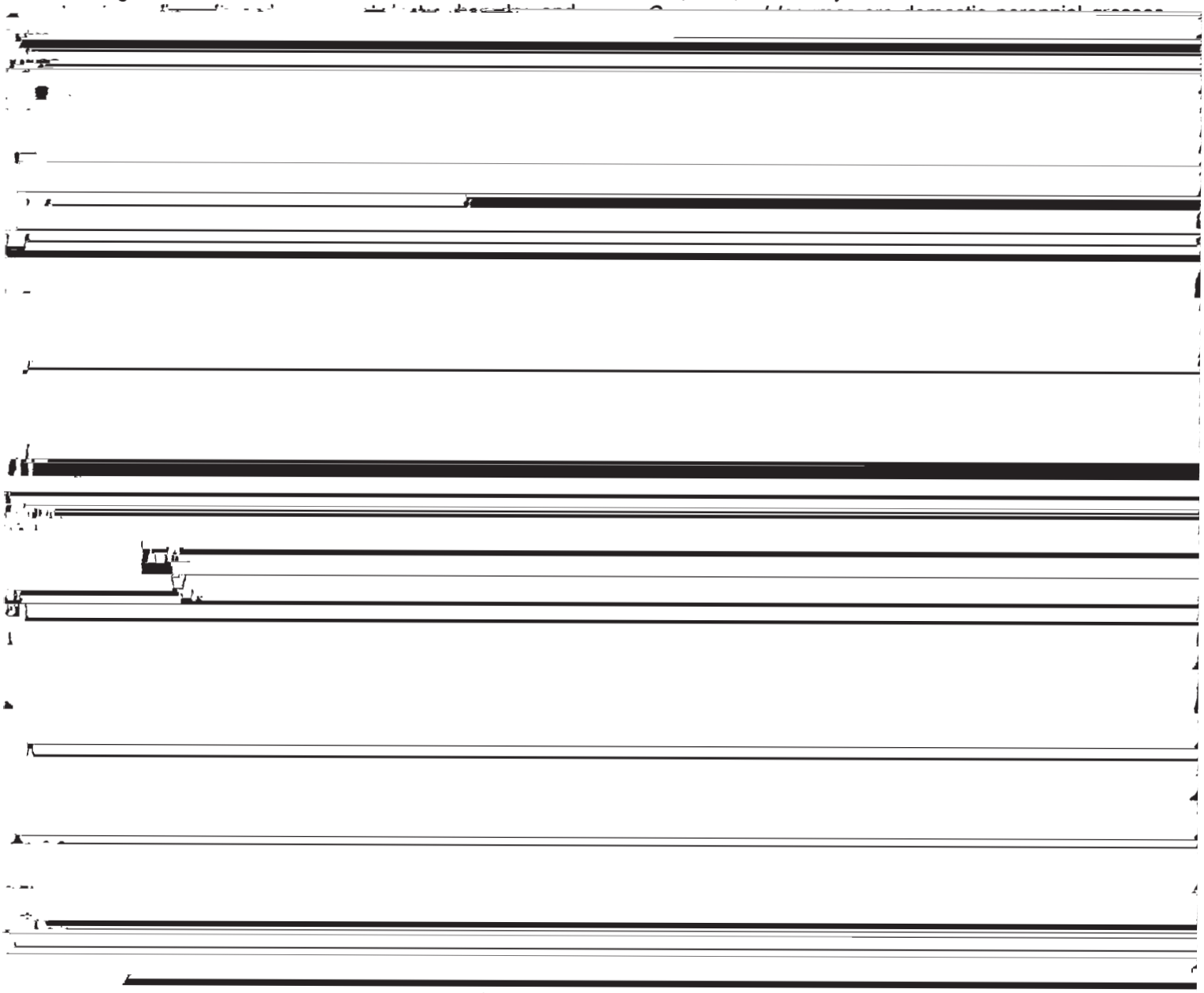
features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome.

recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegeta-

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are

Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.



are not subject to flooding more than once during the annual period of use. They have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they

and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bristle-

Wetland habitat consists of open, marshy or swampy [redacted] *is indicated. More information about the range in*

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and in plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 16 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils

[redacted]

Permeability is estimated on the basis of known rela[redacted] chemical action that dissolves or weakens saturated

be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 16. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-sweil potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced

Soil and water features

Table 17 contains information helpful in planning land

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The

The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Argiustolls (*Arg*, meaning argillic horizons, plus *Ustoll*, the suborder of Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Argiustolls.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consis-

follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Aransas series

The Aransas series consists of deep, clayey soils on bottom lands. These soils formed in calcareous, clayey sediment of alluvial origin. Slopes range from 0 to 1 percent.

Typical pedon of Aransas clay, frequently flooded; from the intersection of Texas Highway 359 and the Nueces River on the Jim Wells-San Patricio County line, about 0.2 mile southwest on Texas Highway 359, and 300 feet northwest of highway right-of-way in pasture:

A11—0 to 2 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak fine and medium blocky structure; extremely hard, very firm, sticky and plastic; common fine roots; few worm casts; common pressure faces on peds; calcareous; moderately alkaline; clear smooth boundary.

A12—2 to 22 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak fine blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few snail shell fragments; many pressure faces on peds; calcareous; moderately alkaline;

Typical pedon of Clareville loam, 0 to 1 percent slopes; from the intersection of Texas Highway 359 and Farm Road 624 in Orange Grove, about 1.55 miles southwest on Texas Highway 359 to gas pipeline marker, and 390 feet east in cultivated field:

Ap—0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, friable, slightly sticky; few fine roots; neutral; abrupt smooth boundary.

A1—5 to 11 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; hard, friable, sticky; few fine roots; few fine pores; neutral; clear smooth boundary.

B21t—11 to 18 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky; few fine roots; many fine pores; few clay films; mildly alkaline; gradual smooth boundary.

B22t—18 to 25 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting

neutral or mildly alkaline in the upper part and moderately alkaline in the lower part. It is clay, clay loam, or sandy clay.

The B3 horizon is brown, grayish brown, pale brown, or gray. It is clay loam or sandy clay.

The C horizon is pale brown, very pale brown, light brownish gray, or white.

Comitas series

The Comitas series consists of deep, sandy soils that formed in sandy and loamy sediments on uplands. Slopes range from 0 to 3 percent.

Typical pedon of Comitas loamy fine sand, 0 to 3 percent slopes; from the intersection of Farm Road 70 and Texas Highway 359 in Sandia, about 4.6 miles southeast on Farm Road 70, 1.2 miles northeast on paved road, and 50 feet northwest in improved pasture:

Ap—0 to 7 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak

[redacted]

tic; few fine soft masses of calcium carbonate; calcareous; moderately alkaline.

Thickness of the A and AC horizons ranges from 24 to 50 inches. When these soils are dry, cracks from 0.3 to 1.0 inch wide extend from the surface or bottom of the Ap into the C horizon. Clay films can occur in the AC and C horizons.

The A horizon is very dark gray or dark gray. It is clay, clay loam, or sandy clay loam.

The AC horizon is gray, grayish brown, brown, or pale brown clay or clay loam in the upper part and light

B23t—28 to 36 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, firm; thin patchy clay films on faces of peds; moderately alkaline; gradual wavy boundary.

B24tca—36 to 40 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak medium subangular blocky structure; hard, firm; thin patchy clay films on faces of peds; 4 to 6 percent, by volume, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Typical pedon of Delmita fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 716 and U.S. Highway 281 in Premont, about 4.6 miles west on Farm Road 716, 6.7 miles north, 1.5 miles west on paved road, 0.2 mile north on ranch road, and 40 feet east in rangeland:

structure parting to weak medium blocky; very hard, very firm, very sticky and very plastic; few fine roots; few fine and medium pores; few dark gray (10YR 4/1) streaks along old closed cracks; noncalcareous in matrix; moderately alkaline; gradual wavy boundary.

Road 236, 2.7 miles west on County Road 237, and 60 feet southwest in pasture:

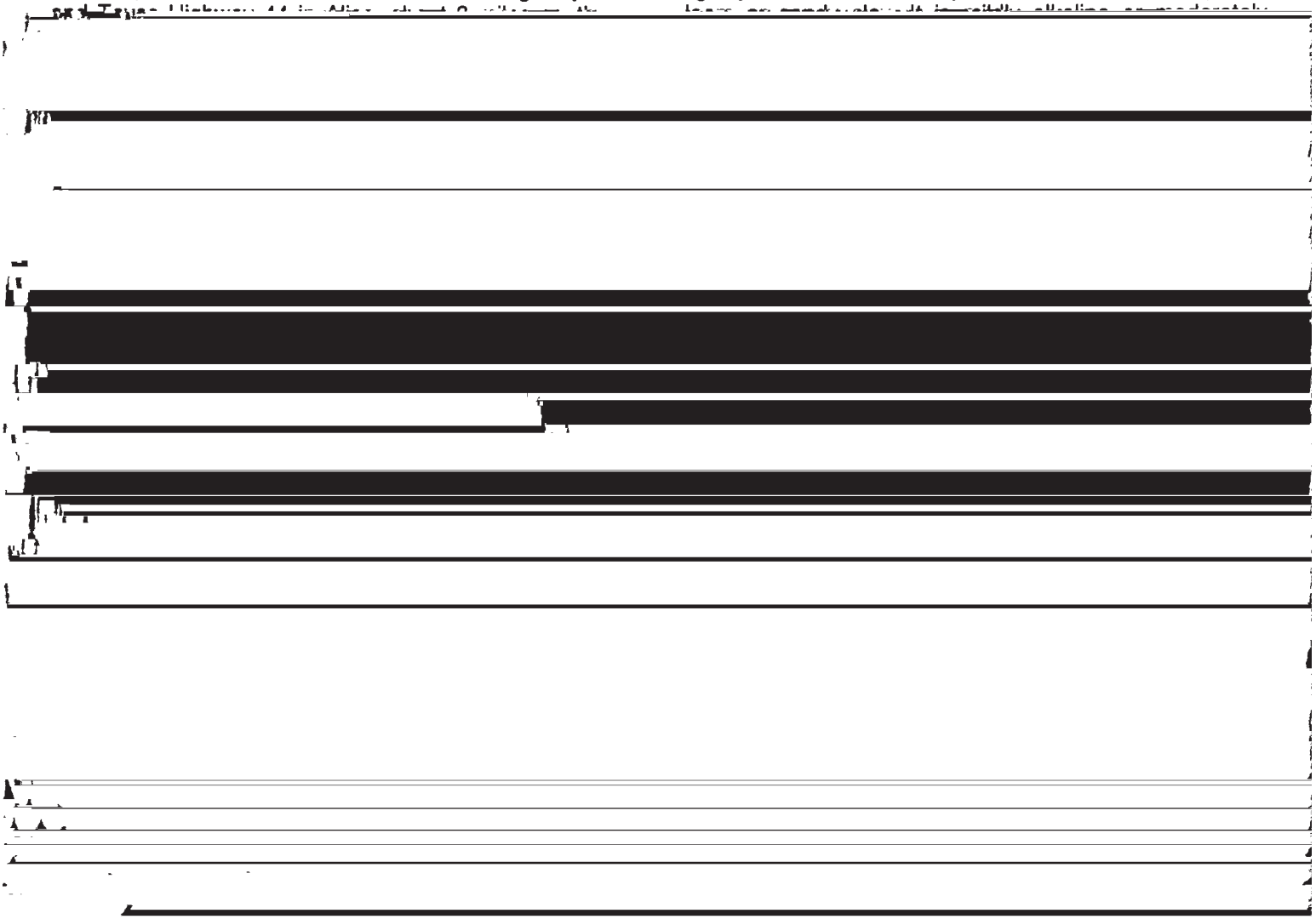
A1—0 to 11 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak

Typical pedon of Lacoste fine sandy loam, in an area of Lacoste-Olmos association, gently undulating; from the intersection of County Line Road and Texas Highway 359 in San Diego, about 9.0 miles north on County Line Road, 0.4 mile east on caliche road to cattleguard, 0.95

roots; few uncoated sand grains; calcareous; moder-

Typical pedon of Leming loamy fine sand, 0 to 5 per-

Typical pedon of Miguel fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 [illegible] Texas Highway 44 in Alice, about 2 miles [illegible] the U.S. Highway 281, 1.7 miles west on Farm Road 625, 0.5 mile north and 0.5 mile west on ranch road, and 50 feet south of road in rangeland:



A1—0 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to weak fine granular; very hard, friable; many fine roots; few insect tunnels; slightly acid; abrupt smooth boundary.

B21t—10 to 13 inches; brown (10YR 5/3) sandy clay, dark brown (10YR 4/3) moist; common medium distinct reddish brown (5YR 4/4) mottles; strong medium prismatic structure parting to moderate medium blocky; extremely hard, firm, sticky and plastic; many fine roots; few fine pores; organic stains and dark coatings on faces of prisms; clay films on faces of peds; neutral; clear smooth boundary.

B22t—13 to 29 inches; brown (7.5YR 5/4) sandy clay

The B3 horizon is light brown, reddish yellow, brown, light yellowish brown, or yellowish red. It is sandy clay loam or sandy clay [illegible] moderately alkaline or moderately alkaline. In the lower part of some pedons this horizon is 3 to 10 percent, by volume, weakly cemented concretions and soft masses of calcium carbonate.

The C horizon is light brownish gray, light gray, light brown, yellowish red, reddish yellow, pink, or brownish yellow. It is sandy clay loam or sandy clay.

Odem series

The Odem series consists of deep, loamy soils that formed in recent loamy alluvial sediments on bottom land. Slopes range from 0 to 1 percent.

Typical pedon of Odem fine sandy loam; from the intersection of U.S. Highway 281 and U.S. Highway 44 in Alice, about 4.3 miles north on U.S. Highway 281, 0.5 mile west on county road, 0.65 mile north along fence, and 525 feet east in cultivated field:

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist;

[redacted]

miles, 0.4 mile northeast on ranch road, and 30 feet northwest in pasture:

A1—0 to 16 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; hard, very friable; few fine and medium roots; few fine pores; neutral; abrupt smooth boundary.

B21t—16 to 30 inches; light brownish gray (10YR 6/2) sandy clay, grayish brown (10YR 5/2) moist; common medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate

Papalote series

The Papalote series consists of deep, loamy soils that formed in clayey and loamy sediments on uplands. Slopes range from 0 to 3 percent.

Typical pedon of Papalote fine sandy loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 281 and U.S. Highway 44 in Alice, about 19.4 miles south on U.S. Highway 281, 3 miles east on paved road, 0.75 mile north on ranch road, and 30 feet east in pasture:

A1—0 to 16 inches; brown (10YR 5/3) fine sandy loam,

The B2t horizon, in the upper part, is dark grayish [redacted] loam, clay, or sandy clay in the upper part and sandy [redacted]

[redacted]

The A horizon is very dark gray, dark gray, very dark grayish brown, dark grayish brown, or brown. It is sandy clay loam or fine sandy loam.

The B2t horizon is dark grayish brown, grayish brown, or brown sandy clay loam or clay loam in the upper part and pale brown, light brown, brown, yellowish brown, or light yellowish brown clay loam or sandy clay loam in the lower part.

The Cca horizon is light brownish gray, very pale brown, pale brown, pinkish gray, light brown, or pink. It is clay loam or sandy clay loam. It is 10 to 40 percent, by volume, soft masses and concretions of calcium carbonate up to 3.5 centimeters wide.

Pettus series

The Pettus series consists of shallow, loamy soils that formed in calcareous loamy sediments on uplands. Slopes range from 0 to 5 percent.

Typical pedon of Pettus sandy clay loam, 0 to 3 percent slopes; from the intersection of U.S. Highway 281 and Texas Highway 359 in Alice, about 3.0 miles west on Texas Highway 359, 10 miles north and 2 miles northwest on County Road 236, and 70 feet southwest in pasture:

A1—0 to 10 inches; grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; common fine and medium roots; common fine pores; common worm casts; few snail shells; common fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B2—10 to 17 inches; light brownish gray (10YR 6/2) sandy clay loam, grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable; common fine roots; common fine pores; common worm casts; few snail shells; common fine and medium

The B2 horizon is grayish brown, light brownish gray, brown, or pale brown. It is loam or sandy clay loam. Calcium carbonate concretions make up 5 to 20 percent of the volume and are mostly less than 1 centimeter wide.

The Cca horizon is light gray, pale brown, or white. The Clca horizon is weakly or moderately cemented platy and fractured caliche. The C2ca horizon is weakly cemented fractured caliche or is about 10 to 50 percent weakly cemented nodular concretions and soft masses of calcium carbonate. The fine earth fraction is brownish sandy clay loam or loam.

Pharr series

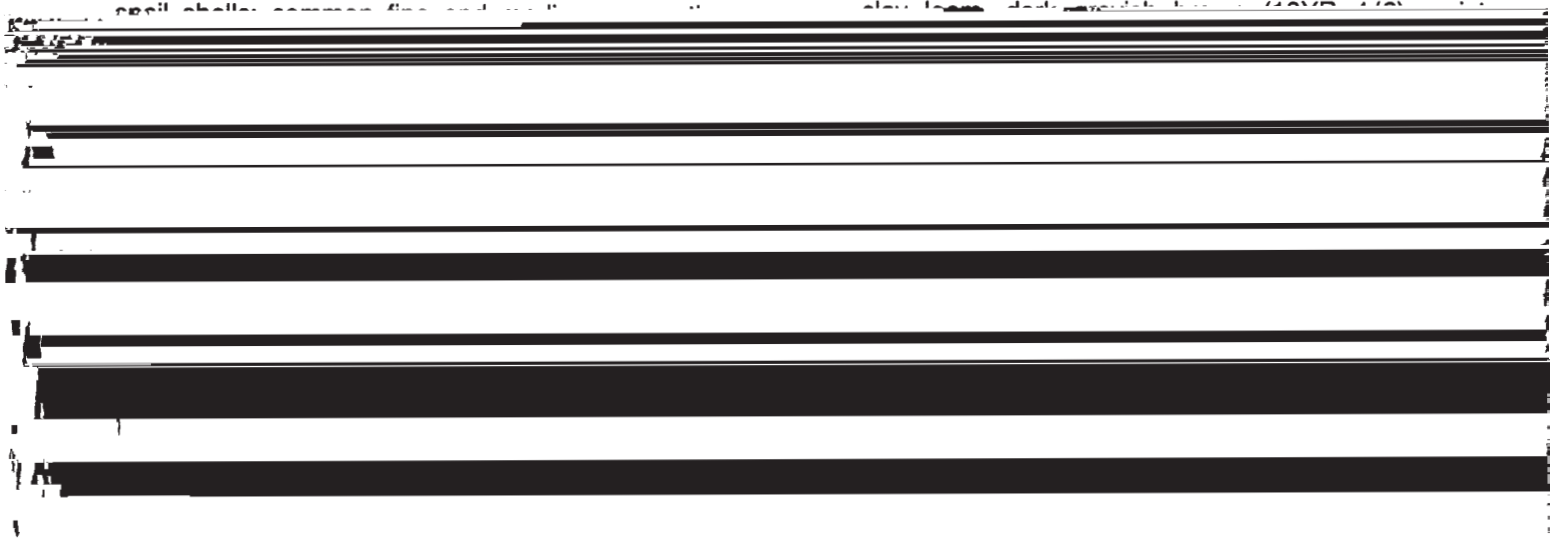
The Pharr series consists of deep, loamy soils that formed in calcareous loamy sediment of eolian or alluvial origin on uplands. Slopes range from 0 to 3 percent.

Typical pedon of Pharr fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 2295 about 15.0 miles south of Alice, 2.8 miles west on Farm Road 2295, 100 feet south along fenceline, and 30 feet west in pasture:

A11—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, very friable; common fine and medium roots; few fine pores; common termite and earthworm tunnels partially filled with calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

A12t—9 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable; few fine roots; few fine pores; common termite and earthworm tunnels partially filled with calcium carbonate; few snail shells; calcareous; moderately alkaline; clear wavy boundary.

B2t—15 to 33 inches; grayish brown (10YR 5/2) sandy



The solum is 40 to 60 inches thick.

The Cca horizon is pale brown, light brown, very pale

pedons there are a few threads and soft masses of calcium carbonate.

The B3 horizon is brown, light brown, reddish yellow, or yellowish red. It is noncalcareous or calcareous and has a few soft masses and concretions of calcium carbonate.

The C horizon is very pale brown, light brown, brown,

Sinton series

The Sinton series consists of deep, loamy soils that formed in calcareous, loamy sediment of alluvial origin on bottom land. Slopes range from 0 to 1 percent.

Typical pedon of Sinton sandy clay loam; from the intersection of Texas Highway 359 and Farm Road 624 in Orange Grove, about 3.4 miles northeast on Texas

Climate and living organisms are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and living organisms are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be much or little, but some time is always needed for horizon differentiation. Usually a long time is needed for distinct horizons to develop.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent material

Parent material refers to the unconsolidated mass from which soil develops.

The soils of Jim Wells County formed in residuum of limestone and sandstone, in ancient and recent alluvium, and in ancient marine deposits. They began forming in the Miocene, Pliocene, and Pleistocene periods.

Shallow soils are on the steeper slopes where erosion has kept pace with soil development. The major shallow soils in the county are the Lacoste, Olmos, Parrita, and Pettus soils, all of which are underlain by caliche.

Moderately deep soils such as the Lattas and Danjer soils formed in calcareous, clayey, marine sediments. The Delmita and Goliad soils formed in loamy and clayey sediments over thick beds of caliche, the Opelika soils formed in loamy and clayey marine sediments, and the Pernitas soils formed in calcareous loamy sediments.

Parent material of the deep soils is mainly alkaline, unconsolidated, sandy, clayey, and loamy sediments. This ancient alluvium or marine material may have been reworked by wind or affected by a high water table many times since it was first deposited. The major soils are Clareville, Comitas, Czar, Delfina, Leming, Miguel, Papaqua, Papalote, Pharr, Racombes, Runge, and Sarita many soils have an accumulation of calcium carbonate a few feet below the surface. Most of the young soils have lime throughout the horizons.

Summer temperatures are high, and winter temperatures are mild. The high temperatures and low rainfall have limited the accumulation of organic matter in the soils.

Plant and animal life

Plants, animals, insects, and bacteria are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in soil structure and porosity are among the changes caused by living organisms.

Vegetation, dominantly grasses, has affected soil formation in Jim Wells County more than other living organisms.

Relief

Relief influences soil formation through its effect on drainage and runoff. If other factors are equal, the degree of profile development depends mainly on the average amount of moisture in the soil. Because nearly level soils absorb more moisture, they generally have a better developed profile than steeper soils, which can erode almost as fast as they form.

Relief also affects the kind and amount of vegetation on a soil. Because slopes that face north and east receive less direct sunlight than those facing south and west, they lose less moisture through evaporation. As a result, the vegetation is denser on slopes facing north and east.

Soils that are nearly level or slightly concave receive more moisture than sloping soils and produce more vegetation; consequently, they generally have more organic matter, which imparts a darker color to the soil.

Time

Time is needed for the formation of soils that have distinct horizons. The differences in the length of time

has been the dominant soil-forming factor, and not time. Lacoste and Pettus soils are examples of such soils.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Dallas Morning News Staff. Texas counties and towns. Texas almanac 1974-75. p. 320, illus.

(4) District Board of Supervisors. 1967. Program and plan for Nueces-Jim Wells-Kleberg Soil and Water Conservation District no. 311. 30 pp., illus.

(5) Pollard, Virginia, 1945. The history of Jim Wells County. A thesis presented in partial fulfillment for the degree of master of science.

(6) Sellards, E. H., W. S. Adkins, and F. B. Plummer. 1932. Geology of Texas, stratigraphy, vol. 1. Univ. Texas Bull. 3232, 1007 pp., illus.

(7) Texas Conservation Needs Committee. 1970. Conservation needs inventory. USDA-SCS publ., 297 pp., illus.

(8) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(9) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Dep. Agric. Handb. 436. 754 pp., illus.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Medium	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

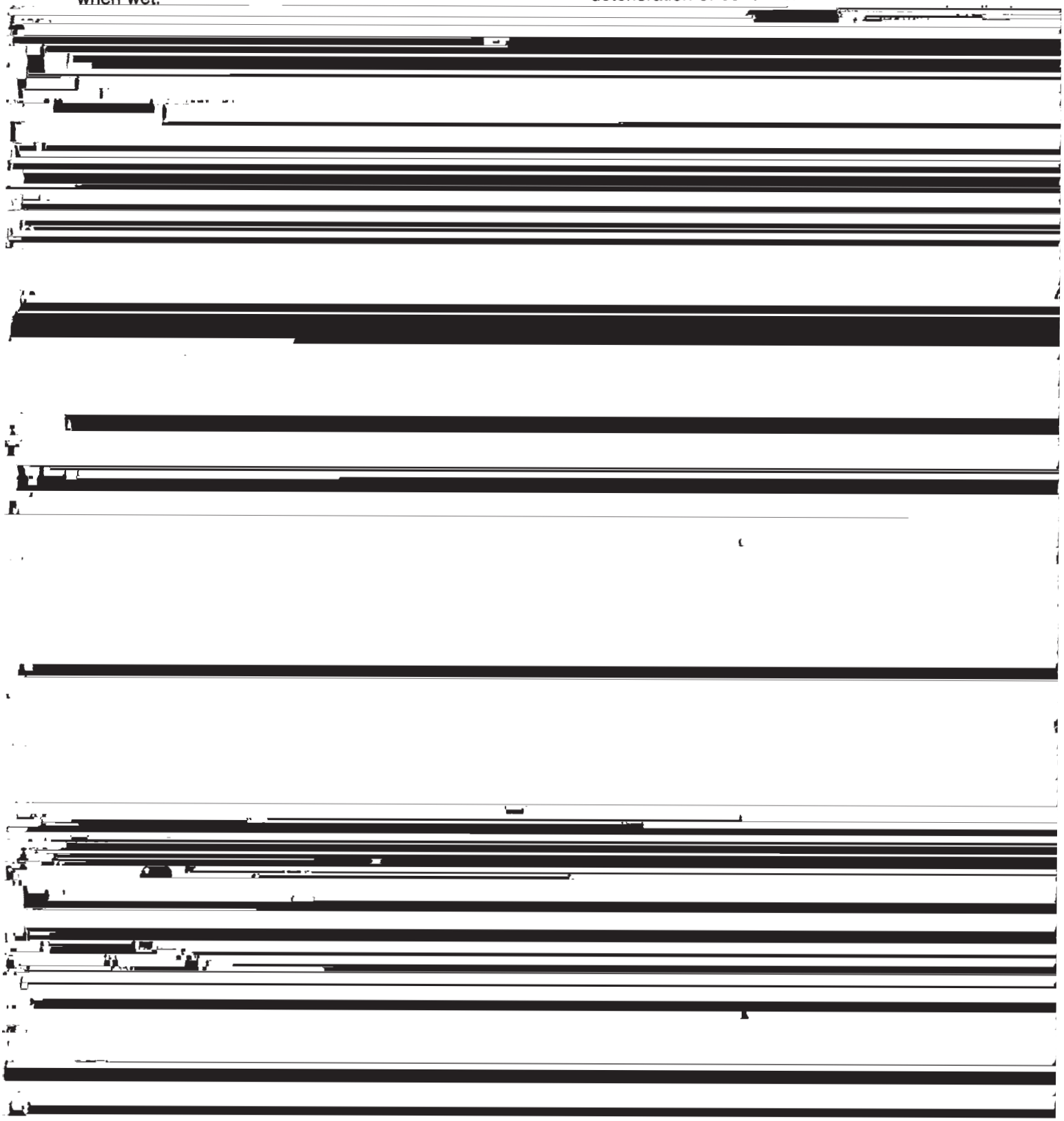
Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.



during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic

crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless

common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject

tection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or

surements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

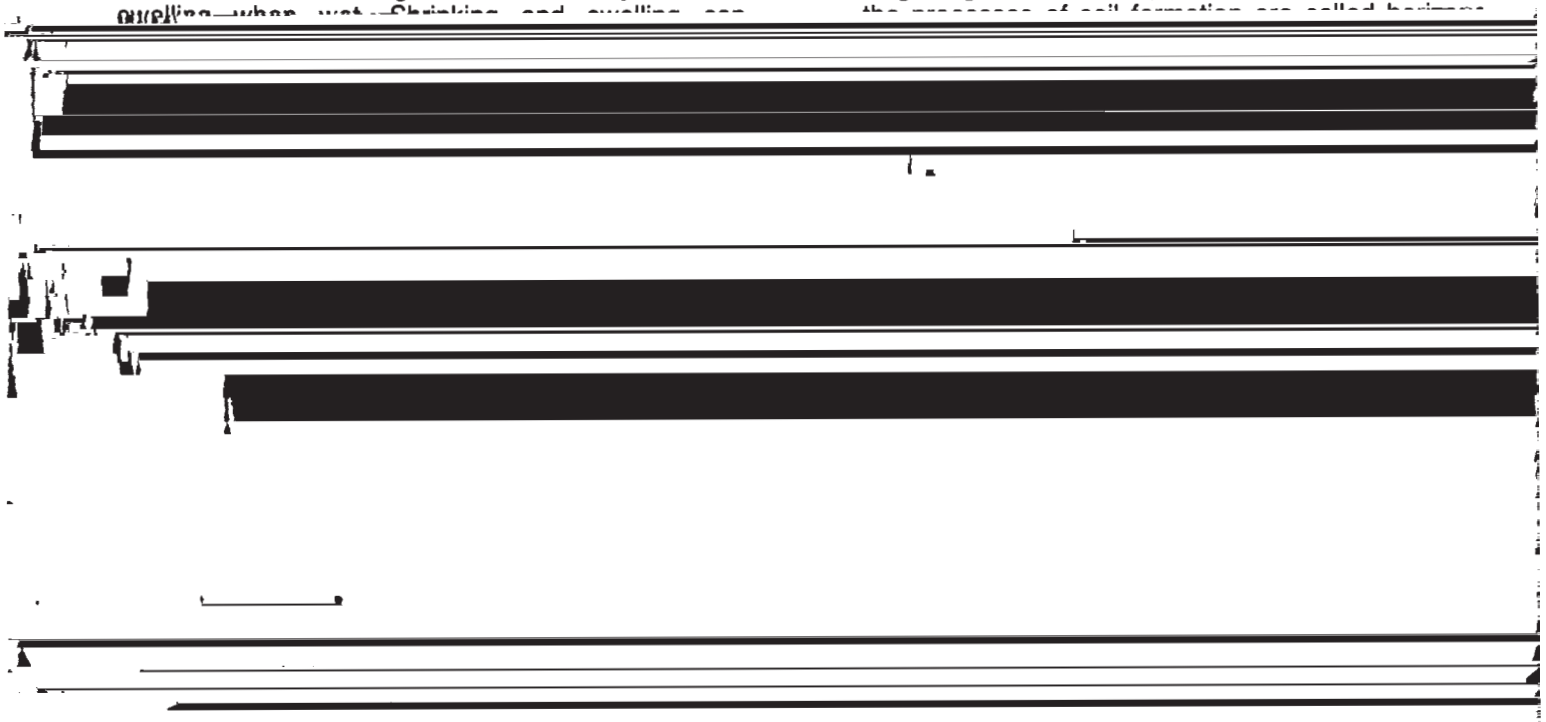
Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can



damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productiv-

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons. those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

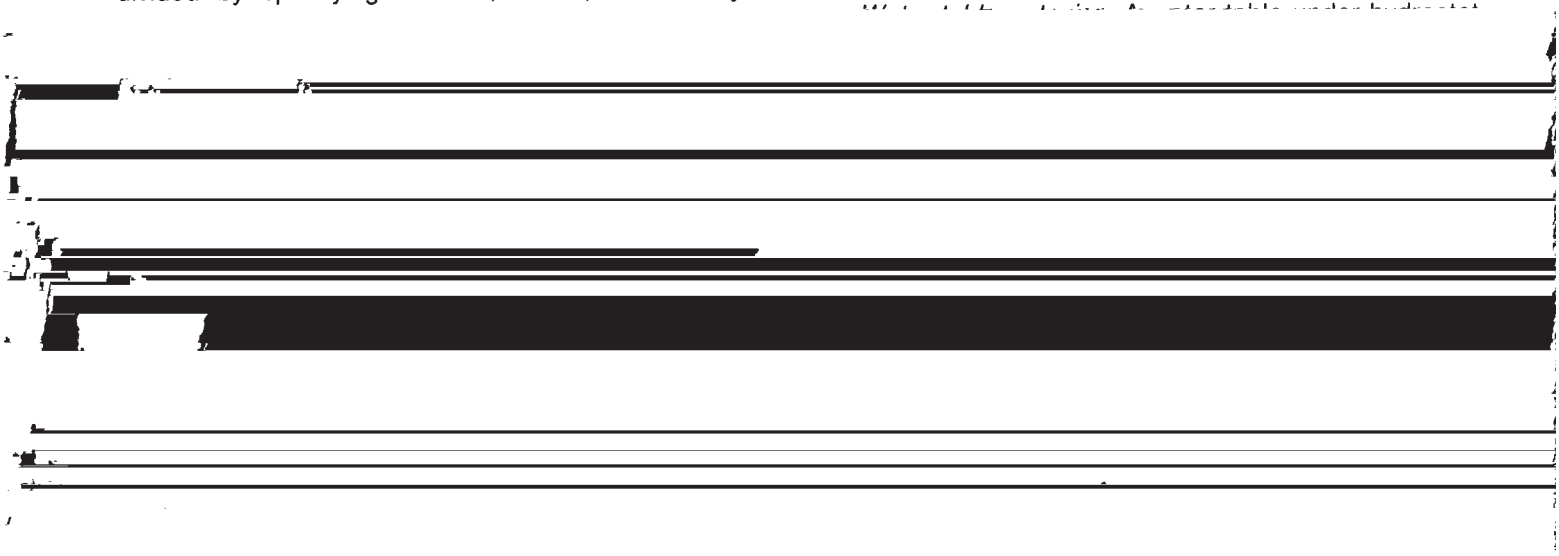
Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop and during the early growing period of the new

to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very

series name, but the limited geographic soil area does not justify creation of a new series.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water. *Water table, apparent.* A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.



Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordi-

ic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-76 at Alice, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	68.0	43.6	55.8	90	22	236	1.24	0.18	2.03	3	0.0
February---	72.1	46.6	59.4	91	25	288	1.58	0.26	2.59	3	0.2
March------	78.1	53.0	65.6	98	33	489	0.79	0.13	1.29	2	0.0
April------	84.7	62.2	73.5	101	42	705	1.56	0.19	2.58	3	0.0
May--------	88.6	67.7	78.1	101	52	871	3.05	1.03	4.66	5	0.0
June-------	93.5	72.3	82.9	101	62	987	3.46	0.87	5.51	4	0.0
July-------	96.3	73.6	85.0	103	68	1,085	1.62	0.25	2.64	3	0.0
August-----	97.4	73.4	85.4	105	66	1,097	2.26	0.32	3.72	4	0.0
September--	92.1	70.0	81.1	103	56	933	6.56	2.54	9.81	7	0.0
October----	85.4	61.1	73.3	97	42	722	3.29	0.64	5.36	4	0.0
November---	76.4	52.7	64.6	92	31	445	1.56	0.27	2.53	3	0.0
December---	69.4	45.7	57.6	88	27	270	1.19	0.27	1.90	3	0.0
Yearly:											
Average--	83.5	60.2	71.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	106	21	---	---	---	---	---	---
Total----	---	---	---	---	---	8,128	28.16	19.84	35.73	44	0.2

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-76 at Alice, Texas]

Probability	Temperature		
	24°F or lower	28°F or lower	32°F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	January 30	February 19	March 16
2 years in 10 later than--	January 17	February 9	March 6
5 years in 10 later than--	(1)	January 19	February 16
First freezing temperature in fall:			
1 year in 10 earlier than--	December 26	December 10	November 13
2 years in 10 earlier than--	January 7	December 19	November 22
5 years in 10 earlier than--	(1)	January 5	December 10

[1]Probability of occurrence is less than 5 years in 10.

TABLE 3.--LENGTH OF GROWING SEASON

[Data were recorded in the period 1951-76 at Alice, Texas. The symbol > means more than]

Probability	Daily minimum temperature during growing season		
	Higher than 24°F	Higher than 28°F	Higher than 32°F
	Days	Days	Days
9 years in 10	>365	308	262
8 years in 10	>365	318	274
5 years in 10	>365	>365	296
2 years in 10	>365	>365	319
1 year in 10	>365	>365	330

TABLE 4.--MAP UNITS AND THEIR POTENTIALS

Map unit	Percent of county	Cultivated farm crops	Rangeland	Urban uses	Recreation
1. Lattas-Opelika-Clareville-----	23	High: low rainfall.	High: low rainfall.	Low: shrink-swell, corrosivity, low strength, percs slowly.	Low: too clayey, percs slowly.
2. Lattas----------	3	High: low rainfall.	High: low rainfall.	Low: shrink-swell, corrosivity, low strength, percs slowly.	Low: too clayey, percs slowly.
3. Pernitas-Olmos-Pettus---------	20	Medium: erodes easily, low rainfall, cemented pan, small stones.	Medium: erodes easily, low rainfall, cemented pan.	Medium: shrink-swell, corrosivity, low strength, seepage, cemented pan.	Medium: too clayey, slope, small stones.
4. Goliad-Parrita-Lacoste--------	8	Medium: erodes	Medium: erodes	Medium: shrink-swell,	High: too clayey,

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Aransas clay	1,712	0.3
2	Aransas clay, frequently flooded	2,943	0.5
3	Clareville loam, 0 to 1 percent slopes	25,545	4.7
4	Comitas loamy fine sand, 0 to 3 percent slopes	2,596	0.5
5	Czar fine sandy loam, 0 to 1 percent slopes	11,374	2.1
6	Czar fine sandy loam, 1 to 3 percent slopes	14,703	2.7
7	Danjer clay, 0 to 1 percent slopes	1,460	0.3
8	Danjer clay, 1 to 3 percent slopes	2,113	0.4
9	Delfina loamy fine sand, 0 to 2 percent slopes	19,064	3.5
10	Delfina fine sandy loam, 0 to 1 percent slopes	29,280	5.4
11	Delfina fine sandy loam, 1 to 3 percent slopes	16,949	3.1
12	Delmita fine sandy loam, 1 to 3 percent slopes	1,944	0.4
13	Edroy clay	7,644	1.4
14	Edroy clay, depressional	8,407	1.6
15	Goliad fine sandy loam, 0 to 1 percent slopes	1,417	0.3
16	Goliad fine sandy loam, 1 to 3 percent slopes	7,343	1.4
17	Goliad sandy clay loam, 0 to 1 percent slopes	5,713	1.1
18	Goliad sandy clay loam, 1 to 3 percent slopes	1,860	0.3
19	Lacoste-Olmos association, gently undulating	10,422	1.9
20	Lattas clay, 0 to 1 percent slopes	61,312	11.3
21	Lattas clay, 1 to 3 percent slopes	4,620	0.9
22	Leming loamy fine sand, 0 to 5 percent slopes	4,268	0.8
23	Miguel fine sandy loam, 1 to 3 percent slopes	6,973	1.3
24	Odem fine sandy loam	1,177	0.2
25	Oil-Waste land	100	(1)
26	Olmos association, undulating	17,054	3.1
27	Opelika fine sandy loam	45,090	8.3
28	Opelika fine sandy loam, depressional	31,005	5.7
29	Papagua soils, depressional	23,346	4.3
30	Papalote loamy fine sand, 0 to 3 percent slopes	10,701	2.0
31	Papalote fine sandy loam, 0 to 1 percent slopes	15,720	2.9
32	Parrita sandy clay loam, 0 to 3 percent slopes	15,085	2.8
33	Pernitas fine sandy loam, 1 to 5 percent slopes	7,369	1.4
34	Pernitas sandy clay loam, 0 to 1 percent slopes	11,693	2.2
35	Pernitas sandy clay loam, 1 to 5 percent slopes	23,181	4.3
36	Pernitas sandy clay loam, gullied	293	(1)
37	Pettus sandy clay loam, 0 to 3 percent slopes	3,231	0.6
38	Pettus sandy clay loam, 3 to 5 percent slopes	1,418	0.3
39	Pettus sandy clay loam, gullied	3,306	0.6
40	Pharr fine sandy loam, 0 to 1 percent slopes	3,098	0.6
41	Pharr fine sandy loam, 1 to 3 percent slopes	5,062	0.9

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Grain sorghum	Cotton lint	Flax	Pasture
	Bu	Lb	Bu	AUM[1]
Aransas:				
1	55	450	---	5.0
2	---	---	---	5.0
Clareville:				
3	55	450	16	---
Comitas:				
4	45	---	---	3.0
Czar:				
5	45	350	---	4.0
6	40	325	---	3.5
Danjer:				
7	55	375	15	4.0
8	45	325	10	3.5
Delfina:				
10	50	375	---	---
9, 11	35	250	---	---
Delmita:				
12	25	200	---	2.0
Edroy:				
13	35	300	---	---
14	---	---	---	---
Goliad:				
15, 17	40	325	---	3.0
16, 18	35	275	---	2.5
Lacoste:				
[2]19:				
Lacoste part	30	---	---	3.5
Olmos part	---	---	---	---
Lattas:				
20	60	400	15	4.0
21	50	350	10	3.5
Leming:				
22	65	350	---	---
Miguel:				
23	30	200	7	---
Odem:				
24	55	300	---	---
Oil-Waste land:				
25	---	---	---	---
Olmos:				
[2]26	---	---	---	---

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grain sorghum	Cotton lint	Flax	Pasture
	Bu	Lb	Bu	AUM[1]
Opelika:				
27	35	200	8	4.0
28	30	200	7	4.0
Papagua:				
29	45	250	---	4.0
Papalote:				
30	40	200	7	5.0
31	45	250	8	5.5
Parrita:				
32	25	---	---	2.0
Pernitas:				
33, 35	25	200	---	2.5
34	40	300	---	3.0
36	---	---	---	2.0
Pettus:				
37	25	---	---	2.0
38	20	---	---	1.5
39	---	---	---	1.0
Pharr:				
40, 42	65	450	---	---
41, 43	45	400	---	---
Pits:				
44	---	---	---	---
Racombes:				
45	65	500	---	---
Runge:				
46, 49	55	250	14	---
47, 50	50	250	12	---
48	45	200	10	---
Sarita:				
51	---	---	---	---
Sinton:				
52	70	350	---	---

[1] [illegible]

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	---	---	---	---	---
II	284,362	80,605	29,280	85,622	88,855
III	206,842	95,449	108,797	2,596	---
IV	10,731	10,731	---	---	---
V	14,166	---	14,166	---	---
VI	3,599	3,599	---	---	---
VII	20,597	---	---	20,597	---
VIII	---	---	---	---	---

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1, 2---------- Aransas	Clayey Bottomland----------	Favorable	8,000	Virginia wildrye----------	10
		Normal	6,500	Little bluestem----------	10
		Unfavorable	4,500	Switchgrass----------	10
				Fourflower trichloris---------	10
				Indiangrass----------	10
				Vine-mesquite----------	10
				Buffalograss----------	10
				Panicum----------	5
3---------- Clareville	Clay Loam----------	Favorable	5,800	Twoflower trichloris----------	13
		Normal	5,000	Fourflower trichloris---------	12
		Unfavorable	3,000	Little bluestem----------	10
				Pinhole bluestem----------	10
				Plains bristlegrass----------	10
				Buffalograss----------	10
				Pink pappusgrass----------	10
				Arizona cottontop----------	5
				Sideoats grama----------	5
4---------- Comitas	Loamy Sand----------	Favorable	4,500	Little bluestem----------	20
		Normal	3,500	Crinkleawn----------	10
		Unfavorable	2,000	Switchgrass----------	10
				Arizona cottontop----------	10
				Plains bristlegrass----------	10
				Tanglehead----------	5
				Sideoats grama----------	5
				Hooded windmillgrass----------	5
				Fall witchgrass----------	5
				Pink pappusgrass----------	5
5, 6---------- Czar	Sandy Loam----------	Favorable	5,000	Little bluestem----------	20
		Normal	4,000	Fourflower trichloris---------	20
		Unfavorable	3,000	Arizona cottontop----------	20
				Plains bristlegrass----------	10
				Hooded windmillgrass----------	5
				Nash windmillgrass----------	5
7, 8---------- Danjer	Blackland----------	Favorable	4,000	Plains bristlegrass----------	20
		Normal	3,500	Sideoats grama----------	10
		Unfavorable	3,000	Vine-mesquite----------	10
				Texas cupgrass----------	10
				Arizona cottontop----------	10
				Plains lovegrass----------	10
				Fourflower trichloris---------	5
				Curlymesquite----------	5
9---------- Delfina	Loamy Sand----------	Favorable	4,500	Little bluestem----------	40
		Normal	3,800	Arizona cottontop----------	10
		Unfavorable	2,000	Plains bristlegrass----------	10
				Tanglehead----------	5
				Sideoats grama----------	5
				Hooded windmillgrass----------	5
				Pink pappusgrass----------	5
10, 11---------- Delfina	Tight Sandy Loam----------	Favorable	3,500	Twoflower trichloris----------	10
		Normal	3,000	Hooded windmillgrass----------	10
		Unfavorable	1,000	Pink pappusgrass----------	10
				Buffalograss----------	10
				Sideoats grama----------	8
				Fourflower trichloris---------	7
				Tanglehead----------	7
				Plains bristlegrass----------	7
				Plains lovegrass----------	7
				Arizona cottontop----------	6
				Fringeleaf paspalum----------	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
12---------- Delmita	Sandy Loam----------	Favorable	4,000	Arizona cottontop----------	15
		Normal	3,000	Tanglehead----------	15
		Unfavorable	1,500	Plains lovegrass----------	15
				Hooded windmillgrass----------	10
				Purple threeawn----------	5
				Fringeleaf paspalum----------	5
				Slim tridens----------	5
13---------- Edroy	Claypan Prairie----------	Favorable	5,000	Twoflower trichloris----------	20
		Normal	4,000	Plains bristlegrass----------	10
		Unfavorable	2,500	Buffalograss----------	8
				Arizona cottontop----------	7
				Vine-mesquite----------	7
				Pink pappusgrass----------	7
				Sideoats grama----------	7
				Little bluestem----------	6
14---------- Edroy	Lakebed----------	Favorable	5,000	Hartweg paspalum----------	40
		Normal	4,000	Spike lovegrass----------	10
		Unfavorable	3,000	White tridens----------	10
				Buffalograss----------	5
				Knotroot panicum----------	5
15, 16---------- Goliad	Sandy Loam----------	Favorable	5,500	Fourflower trichloris----------	25
		Normal	4,200	Little bluestem----------	10
		Unfavorable	3,000	Pinhole bluestem----------	10
				Plains bristlegrass----------	10
				Pink pappusgrass----------	10
				Arizona cottontop----------	5
				Sideoats grama----------	5
				Curlymesquite----------	5
17, 18---------- Goliad	Clay Loam----------	Favorable	5,000	Fourflower trichloris----------	30
		Normal	4,100	Little bluestem----------	10
		Unfavorable	3,000	Pinhole bluestem----------	10
				Plains bristlegrass----------	10
				Arizona cottontop----------	10
				Hooded windmillgrass----------	10
19*:					
Lacoste----------	Shallow Sandy Loam----------	Favorable	3,700	Silver bluestem----------	10
		Normal	2,800	Tanglehead----------	10
		Unfavorable	1,500	Arizona cottontop----------	10
				Plains bristlegrass----------	10
				Hooded windmillgrass----------	10
				Fall witchgrass----------	8
				Slim tridens----------	7
				Pink pappusgrass----------	5
				Sand dropseed----------	5
Olmos----------	Shallow Ridge----------	Favorable	2,500	Sideoats grama----------	25
		Normal	1,800	Silver bluestem----------	10
		Unfavorable	1,000	Plains bristlegrass----------	10
				Tanglehead----------	10
				Arizona cottontop----------	5
				Plains lovegrass----------	5
				Twoflower trichloris----------	5
				Pink pappusgrass----------	5
				Slim tridens----------	5
				Wright threeawn----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
20, 21---------- Lattas	Blackland----------	Favorable	4,500	Little bluestem----------	15
		Normal	4,000	Fourflower trichloris----------	15
		Unfavorable	3,000	Indiangrass----------	10
				Arizona cottontop----------	10
				Sideoats grama----------	10
				Buffalograss----------	10
				Pinhole bluestem----------	5
				Pink pappusgrass----------	5
				Plains bristlegrass----------	5
				Vine-mesquite----------	5
				Nash windmillgrass----------	5
22---------- Leming	Sandy----------	Favorable	4,500	Little bluestem----------	20
		Normal	4,000	Crinkleawn----------	10
		Unfavorable	2,000	Switchgrass----------	10
				Arizona cottontop----------	10
				Brownseed paspalum----------	5
				Sideoats grama----------	5
				Hooded windmillgrass----------	5
				Knotroot panicum----------	5
				Plains bristlegrass----------	5
				Pink pappusgrass----------	5
23---------- Miguel	Tight Sandy Loam----------	Favorable	4,500	Little bluestem----------	15
		Normal	3,500	Fourflower trichloris----------	10
		Unfavorable	2,000	Silver bluestem----------	10
				Hooded windmillgrass----------	10

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
27, 28---------- Opelika	Claypan Prairie----------	Favorable	5,000	Twoflower trichloris----------	15
		Normal	4,000	Fourflower trichloris---------	10
		Unfavorable	2,500	Plains bristlegrass----------	10
				Buffalograss----------	8
				Arizona cottontop----------	7
				Pink pappusgrass----------	7
				Sideoats grama----------	7
				Vine-mesquite----------	7
				Pinhole bluestem----------	7
				Curlymesquite----------	7
				Hooded windmillgrass----------	5
				Lovegrass tridens----------	5
29*---------- Papagua	Ramadero----------	Favorable	5,200	Fourflower trichloris---------	30
		Normal	3,500	Arizona cottontop----------	10
		Unfavorable	2,500	Hooded windmillgrass----------	10
				Sideoats grama----------	5
				Lovegrass tridens----------	5
				Plains bristlegrass----------	5
				Fall witchgrass----------	5
				Vine-mesquite----------	5
				Wright threeawn----------	5
30---------- Papalote	Loamy Sand----------	Favorable	4,500	Little bluestem----------	30
		Normal	3,900	Arizona cottontop----------	10
		Unfavorable	2,000	Plains bristlegrass----------	10
				Switchgrass----------	10
				Tanglehead----------	5
				Hooded windmillgrass----------	5
				Sideoats grama----------	5
31---------- Papalote	Tight Sandy Loam----------	Favorable	4,800	Little bluestem----------	20
		Normal	4,000	Fourflower trichloris---------	10
		Unfavorable	2,000	Hooded windmillgrass----------	10
				Sideoats grama----------	7
				Arizona cottontop----------	5
				Tanglehead----------	5
				Lovegrass tridens----------	5
				Plains bristlegrass----------	5
				Plains lovegrass----------	5
32----------	Shallow Sandy Loam----------	Favorable	3,700	Fall witchgrass----------	15

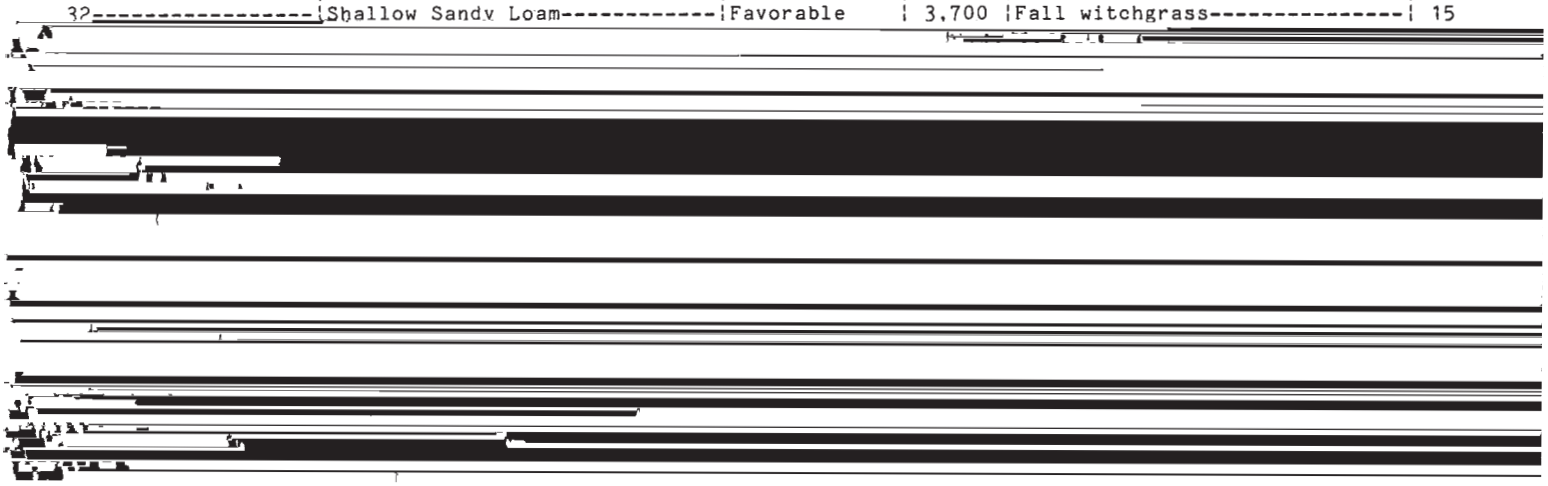


TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
37, 38, 39. Pettus	Shallow Ridge	Favorable	3,200	Arizona cottontop	20
		Normal	2,700	Sideoats grama	10
		Unfavorable	1,500	Little bluestem	10
				Twoflower trichloris	10
				Tanglehead	10
				Pinhole bluestem	5
				Green sprangletop	5
				Slim tridens	5
				Fall witchgrass	5
				Hairy grama	5
				Curlymesquite	5
40, 41, 42, 43. Pharr	Gray Sandy Loam	Favorable	4,800	Twoflower trichloris	10
		Normal	4,000	Fourflower trichloris	10
		Unfavorable	2,500	Plains bristlegrass	10
				Hooded windmillgrass	10
				Pink pappusgrass	10
				Green sprangletop	8
				Lovegrass tridens	7
45. Racombes	Clay Loam	Favorable	6,000	Fourflower trichloris	40
		Normal	5,000	Arizona cottontop	10
		Unfavorable	2,500	Sideoats grama	10
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				Lovegrass tridens	5
				Hooded windmillgrass	5
				Plains bristlegrass	5
				Buffalograss	5
				Vine-mesquite	5
				Pink pappusgrass	5
46, 47, 48, 49, 50. Runge	Sandy Loam	Favorable	5,400	Little bluestem	20
		Normal	4,800	Fourflower trichloris	10
		Unfavorable	3,000	Twoflower trichloris	10
				Arizona cottontop	10
				Plains bristlegrass	10
				Pink pappusgrass	10
				Mesquite	5
51. Sarita	Sandy	Favorable	5,000	Seacoast bluestem	50
		Normal	4,000	Brownseed paspalum	5
		Unfavorable	2,000	Indiangrass	5
				Switchgrass	5
				Tanglehead	5
				Fringeleaf paspalum	5
				Hooded windmillgrass	5
52. Sinton	Loamy Bottomland	Favorable	7,000	Fourflower trichloris	15
		Normal	6,000	Little bluestem	15
		Unfavorable	4,000	Vine-mesquite	10
				Switchgrass	5
				Southwestern bristlegrass	5

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Aransas: 1, 2	Severe: floods, too clayey, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Clareville: 3	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Comitas: 4	Moderate: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.
Czar: 5, 6	Slight	Slight	Slight	Slight	Moderate: low strength.
Danjer: 7, 8	Severe: too clayey, cutbanks cave.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Delfina: 9, 10, 11	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Delmita: 12	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
Edroy: 13, 14	Severe: floods, wetness, cutbanks cave.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Goliad: 15, 16, 17, 18	Moderate: cemented pan.	Moderate: shrink-swell.	Moderate: shrink-swell, cemented pan.	Moderate: shrink-swell, cemented pan.	Moderate: shrink-swell, low strength.
Lacoste: [1]19:					
Lacoste part	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
Olmos part	Severe: cemented pan, small stones.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
Lattas: 20, 21	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Leming: 22	Moderate: too clayey, cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Miguel: 23	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
Odem: 24	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Oil-Waste land: 25	---	---	---	---	---
Olmos: 1 26	Severe: cemented pan, small stones.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
Opelika: 27	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: low strength.
28	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: low strength, floods.
Papagua: 1 29	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, shrink-swell.
Papalote: 30, 31	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: corrosive, shrink-swell.	Moderate: low strength, shrink-swell.
Parrita:					

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Sarita: 51	Severe: too sandy, cutbanks cave.	Slight	Moderate: low strength, shrink-swell.	Slight	Moderate: low strength.
Sinton: 52	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aransas:					
1, 2	Severe: percs slowly, floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
Clareville:					
3	Moderate: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Comitas:					
4	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Czar:					
5, 6	Slight	Moderate: seepage.	Slight	Slight	Good.
Danjer:					
7	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
8	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Delfina:					
9	Moderate: percs slowly.	Slight	Slight	Slight	Fair: too sandy.
10	Moderate: percs slowly.	Slight	Slight	Slight	Good.
11	Moderate: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Delmita:					
12	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Fair: thin layer.
Edroy:					
13, 14	Severe: percs slowly.	Slight	Severe: floods,	Severe: floods,	Poor: too clayey,

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Leming: 22	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: too sandy.
Miguel: 23	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Odem: 24	Severe: floods.	Severe: floods, seepage.	Severe: floods.	Severe: floods, seepage.	Good.
Oil-Waste land: 25	---	---	---	---	---
Olmos: 26	Severe: cemented pan.	Severe: cemented pan, small stones.	Severe: cemented pan, small stones.	Slight	Poor: cemented pan, small stones.
Opelika: 27	Severe: percs slowly.	Slight	Moderate: wetness,	Moderate: wetness,	Good.
28	Severe: percs slowly, floods.	Slight	Severe: floods.	Severe: floods.	Good.
Papagua: 29	Severe: percs slowly.	Slight	Moderate: wetness, floods.	Moderate: floods.	Fair: too clayey.
Papalote: 30, 31	Severe: percs slowly.	Slight	Slight	Slight	Good.
Parrita: 32	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Slight	Poor: thin layer.
Pernitas: 33, 34, 35, 36	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Pettus: 37, 38, 39	Slight	Moderate: seepage.	Slight	Slight	Poor: thin layer.
Pharr: 40, 42	Slight	Moderate: seepage.	Slight	Slight	Good.
41, 43	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Pits: 44	---	---	---	---	---
Racombes:					

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Runge:					
46, 49	Slight	Moderate: seepage.	Slight	Slight	Good.
47, 48, 50	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Sarita:					
51	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
Sinton:					
52	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[redacted]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aransas: 1, 2	Poor: shrink-swell,	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey,

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Miguel:				

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Runge: 46, 47, 48, 49, 50---	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
Sarita: 51----------	Fair: low strength.	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Sinton: 52----------	Moderate: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Aransas: 1, 2	Slight	Moderate: compressible, low strength.	Percs slowly, floods, wetness.	Slow intake, floods, wetness.	Percs slowly, floods, wetness.	Percs slowly, wetness.
Clareville: 3	Moderate: seepage.	Moderate: compressible.	Percs slowly	Percs slowly	Favorable	Favorable.
Comitas: 4	Severe: seepage.	Moderate: piping.	Not needed	Fast intake, droughty.	Too sandy	Droughty, erodes easily.
Czar: 5, 6	Moderate: seepage.	Moderate: compressible.	Favorable	Favorable	Favorable	Favorable.
Danjer: 7, 8	Slight	Moderate: compressible, unstable fill.	Percs slowly, cutbanks cave.	Slow intake	Percs slowly	Percs slowly.
Delfina: 9, 10, 11	Moderate: seepage.	Slight	Favorable	Favorable	Favorable	Favorable.
Delmita: 12	Severe: cemented pan.	Moderate: thin layer.	Cemented pan	Rooting depth	Cemented pan	Rooting depth.
Edroy: 13, 14	Moderate: seepage, thin layer.	Moderate: compressible.	Floods, percs slowly.	Percs slowly, floods, wetness.	Percs slowly, wetness.	Percs slowly, wetness.
Goliad: 15, 16, 17, 18	Severe: cemented pan, seepage.	Moderate: thin layer, compressible.	Not needed	Thin layer	Cemented pan	Favorable, erodes easily.
Lacoste: 19:						
Lacoste part	Severe: cemented pan, seepage.	Severe: thin layer.	Cemented pan	Droughty, rooting depth.	Cemented pan	Droughty, rooting depth.
Olmos part	Severe: cemented pan.	Severe: thin layer, large stones.	Not needed	Thin layer, excess lime.	Cemented pan	Not needed.
Lattas: 20, 21	Slight	Moderate: compressible, unstable fill.	Percs slowly, cutbanks cave.	Slow intake	Percs slowly	Percs slowly.
Leming: 22	Slight	Moderate: piping.	Percs slowly	Droughty, erodes easily.	Too sandy	Droughty, too sandy.
Miguel: 23	Slight	Slight	Percs slowly	Slow intake	Favorable	Percs slowly.
Odem: 24	Severe: seepage.	Moderate: unstable fill, piping.	Not needed	Fast intake, seepage.	Not needed	Favorable.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Oil-Waste land: 25	---	---	---	---	---	---
Olmos: [1]26	Severe: cemented pan.	Severe: thin layer, large stones.	Not needed	Thin layer, excess lime.	Cemented pan	Not needed.
Opelika: 27, 28	Moderate: seepage.	Moderate: compressible.	Percs slowly	Slow intake	Favorable	Favorable.
Papagua: [1]29	Moderate: seepage.	Slight	Percs slowly	Slow intake	Favorable	Favorable.
Papalote: 30, 31	Moderate: seepage.	Slight	Percs slowly	Favorable	Favorable	Favorable.
Parrita: 32	Severe: cemented pan, seepage.	Severe: thin layer.	Not needed	Rooting depth	Cemented pan, rooting depth.	Rooting depth.
Pernitas: 33, 34, 35, 36	Moderate: seepage.	Moderate: compressible, shrink-swell.	Not needed	Excess lime, seepage.	Favorable	Favorable.
Pettus: 37, 38, 39	Severe: seepage.	Moderate: thin layer, seepage.	Not needed	Excess lime, seepage, rooting depth.	Cemented pan, droughty.	Droughty, rooting depth.
Pharr: 40, 41, 42, 43	Moderate: seepage.	Moderate: compressible.	Favorable	Favorable	Favorable	Favorable.
Pits: 44	---	---	---	---	---	---
Racombes: 45	Moderate: seepage.	Moderate: compressible, seepage.	Favorable	Favorable	Not needed	Not needed.
Runge: 46, 47, 48, 49, 50	Moderate: seepage.	Moderate: compressible.	Not needed	Favorable	Favorable	Favorable.
Sarita: 51	Severe: seepage.	Severe: seepage, unstable fill.	Not needed	Fast intake, droughty.	Too sandy	Droughty.
Sinton: 52	Severe: seepage.	Moderate: compressible, piping.	Floods	Floods	Favorable	Favorable.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 13.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aransas:				
1, 2	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.
Clareville:				
3	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Comitas:				
4	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Czar:				
5	Slight	Slight	Slight	Slight.
6	Slight	Slight	Moderate: slope.	Slight.
Danjer:				
7, 8	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Delfina:				
9	Moderate: percs slowly, too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
10	Moderate: percs slowly.	Slight	Slight	Slight.
11	Moderate: percs slowly.	Slight	Moderate: slope.	Slight.
Delmita:				
12	Slight	Slight	Moderate: cemented pan.	Slight.
Edroy:				
13, 14	Severe: wetness, floods, too clayey.	Severe: wetness, floods, too clayey.	Severe: wetness, floods, too clayey.	Severe: wetness, floods, too clayey.
Goliad:				
15	Slight	Slight	Slight	Slight.
16	Slight	Slight	Moderate: slope.	Slight.
17, 18	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
Lacoste:				
[1]19:				
Lacoste part	Slight	Slight	Severe: cemented pan.	Slight.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lacoste: Olmos part	Severe: small stones, large stones.	Severe: small stones, large stones.	Severe: small stones, large stones.	Severe: small stones, large stones.
Lattas: 20, 21	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Leming: 22	Moderate: too sandy, percs slowly.	Moderate: too sandy.	Moderate: too sandy, percs slowly.	Moderate: too sandy.
Miguel: 23	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Odem: 24	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Oil-Waste land: 25	---	---	---	---
Olmos: [1]26	Severe: small stones, large stones.	Severe: small stones, large stones.	Severe: small stones, large stones.	Severe: small stones, large stones.
Opelika: 27, 28	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
Papagua: [1]29	Moderate: too sandy, wetness, percs slowly.	Moderate: too sandy, wetness.	Moderate: wetness, too sandy, percs slowly.	Moderate: too sandy.
Papalote: 30	Moderate: percs slowly, too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
31	Moderate: percs slowly.	Slight	Slight	Slight.
Parrita: 32	Moderate: too clayey.	Moderate: too clayey.	Severe: cemented pan.	Moderate: too clayey.
Pernitas: 33	Slight	Slight	Moderate: slope.	Slight.
34	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
35	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
36	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Pettus:				
37	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
38, 39	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey, slope.	Moderate: too clayey.
Pharr:				
40	Slight	Slight	Slight	Slight.
41	Slight	Slight	Moderate: slope.	Slight.
42	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
43	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.

TABLE 14.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements--						Potential as habitat for--		
	Grain and	Grasses	Wild herba-	Shrubs	Wetland	Shallow	Open-land	Wetland	Range-land
	crops	legumes	plants			areas	life	life	life
Aransas:									
1	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair.
2	Very poor	Poor	Fair	Fair	Poor	Good	Poor	Fair	Fair.
Clareville:									
3	Good	Good	Fair	Good	Poor	Very poor	Good	Very poor	Fair.
Comitas:									
4	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Czar:									
5, 6	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Danjer:									
7	Good	Good	Fair	Fair	Poor	Poor	Good	Poor	Fair.
8	Fair	Good	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
Delfina:									
9, 10, 11	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Delmita:									
12	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Edroy:									
13	Fair	Fair	Poor	Poor	Poor	Good	Fair	Fair	Poor.
14	Very poor	Poor	Poor	Poor	Poor	Good	Poor	Fair	Poor.
Goliad:									
15, 17	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
16, 18	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Lacoste:									
19:									

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

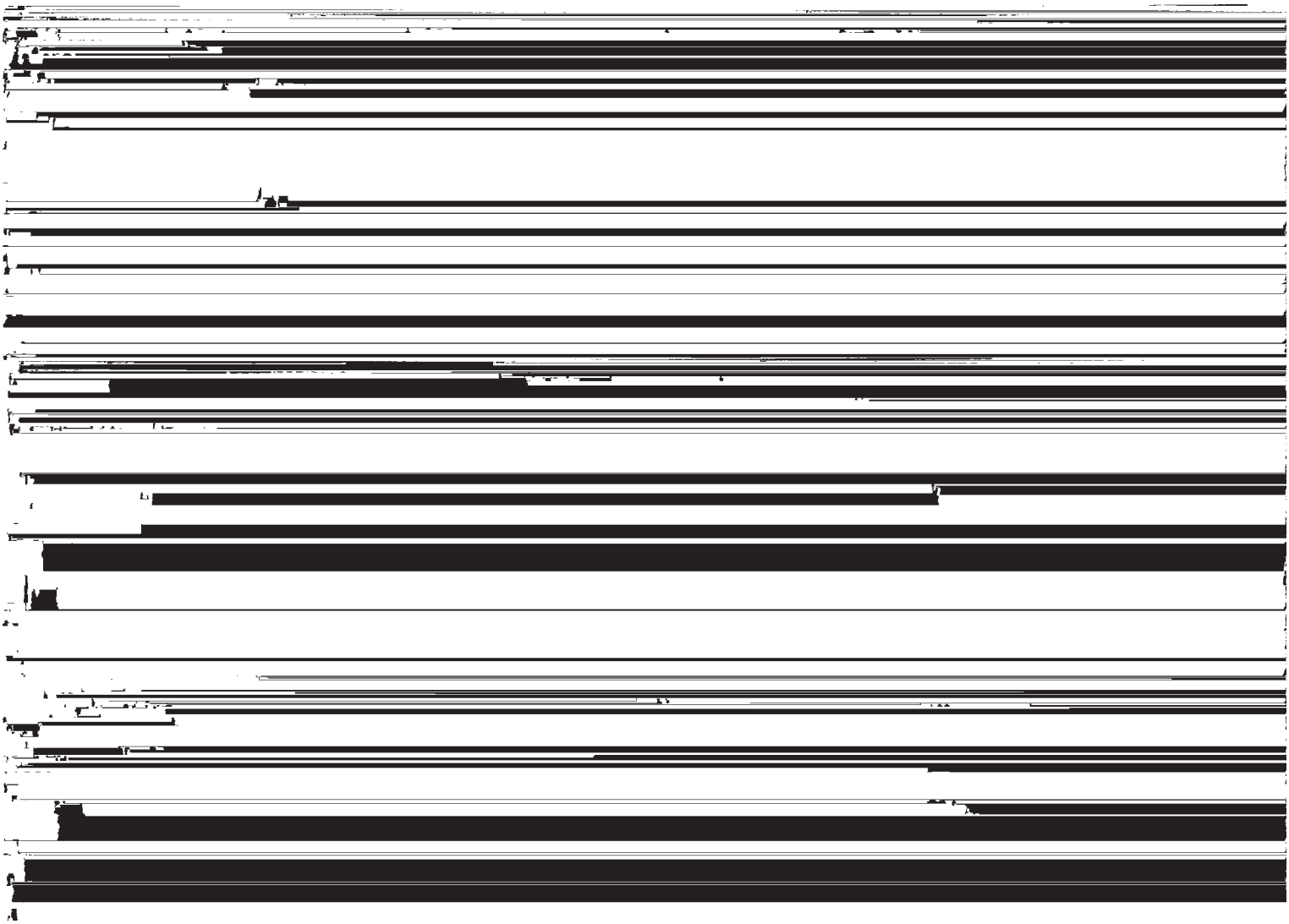

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aransas:											
1, 2	0-65	Clay	CH	A-7-6	0	100	95-100	95-100	75-95	51-75	30-50
Clareville:											
3	0-11	Loam	CL, SC	A-6, A-7	0	98-100	95-100	90-100	45-70	32-48	15-27
	11-38	Clay loam, clay, sandy clay.	CL, CH	A-7	0	98-100	95-100	90-100	51-80	46-60	25-37
	38-64	Clay loam, loam	CL, CH	A-6, A-7	0	95-100	85-100	85-100	51-75	36-52	17-30
Comitas:											
[redacted]	0-32	Loamy fine sand	SM, SW-SC	A-2-4	0	95-100	95-100	85-100	15-25	<25	NP-4
	32-75	Fine sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2-4, A-2-6, A-4, A-6	0	95-100	90-100	80-95	30-50	<34	NP-14
Czar:											
5, 6	0-13	Fine sandy loam	SM-SC, SC	A-2-4, A-4	0	100	100	90-100	30-50	<30	4-11
	13-68	Sandy clay loam, fine sandy [redacted]	SC, CL	A-6	0	97-100	90-100	85-95	36-55	30-39	11-18
Danjer:											
7, 8	0-6	Clay	CH	A-7-6	0	95-100	95-100	90-100	75-95	52-70	30-45
	6-65	Clay, clay loam	CH	A-7-6	0	95-100	95-100	90-100	70-95	52-70	30-45
Delfina:											
9	0-11	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	100	100	85-100	20-45	<25	NP-7
	11-30	Sandy clay loam, [redacted]	SC, CL	A-6, A-7	0	100	100	90-100	40-55	34-44	14-22

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Goliad:											
15, 16	0-11	Fine sandy loam	SM, SC, SM-SC	A-4	0	100	100	70-100	36-50	<30	NP-10
	11-15	Sandy clay loam, sandy clay, clay loam.	SC, CL	A-7-6	0	95-100	90-100	85-100	45-70	41-48	20-26
	15-28	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	85-100	80-100	51-80	45-57	22-32
	28-32	Cemented	---	---	---	---	---	---	---	---	---
17, 18	0-11	Sandy clay loam	SC, CL	A-6	0	100	100	75-100	40-65	30-39	11-18
	11-15	Sandy clay loam, sandy clay, clay loam.	SC, CL	A-7-6	0	95-100	90-100	85-100	45-70	41-48	20-26
	15-28	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	85-100	80-100	51-80	45-57	22-32
	28-32	Cemented	---	---	---	---	---	---	---	---	---
Lacoste:											
19:											
Lacoste part	0-7	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0-5	80-100	80-100	65-85	30-45	<25	NP-7
	7-12	Sandy clay loam, fine sandy loam, gravelly sandy clay loam.	SC, CL	A-2-4, A-2-6, A-4, A-6	0-5	75-100	70-100	65-90	30-55	25-35	8-15
	12-15	Cemented	---	---	---	---	---	---	---	---	---
Olmos part	0-9	Gravelly loam	GC, GM-GC, SC, SM-SC	A-2-4, A-2-6	0-30	35-75	25-65	25-55	20-35	25-35	7-15
	9-35	Cemented	---	---	---	---	---	---	---	---	---
Lattas:											
20, 21	0-5	Clay	CH, SC, CL	A-7-6	0	100	95-100	85-100	45-85	41-60	20-36
	5-70	Clay, silty clay, clay loam.	CH	A-7-6	0	100	90-100	85-100	70-90	51-70	28-45
Leming:											
22	0-24	Loamy fine sand	SM-SC, SM	A-2-4	0	95-100	95-100	50-75	20-35	<30	NP-7
	24-55	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	95-100	80-95	45-60	41-55	20-30
	55-65	Sandy clay loam, sandy clay, clay loam.	CL, SC	A-6, A-7-6	0-10	95-100	90-100	80-95	40-60	30-45	11-25
Miguel:											
23	0-10	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	90-100	15-45	<25	NP-7
	10-33	Sandy clay, clay	CL, SC, CH	A-7-6	0	95-100	95-100	90-100	45-70	41-55	20-32
	33-60	Sandy clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	90-100	90-100	38-70	30-45	15-28
Odem:											
[illegible]	0-[illegible]	[illegible]	SM-SC	SM A-2-4	0	100	100	90-100	20-30	<25	NP-7

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Olmos:											
126	0-9	Gravelly loam	GC, GM-GC, SC, SM-SC	A-2-4, A-2-6	0-30	35-75	25-65	25-55	20-35	25-35	7-15
	9-35	Cemented	---	---	---	---	---	---	---	---	---
Opelika:											
27, 28	0-4	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	90-100	30-40	<30	NP-7
	4-10	Sandy clay, sandy clay loam, clay loam.	SC, CL	A-6, A-7-6	0	95-100	95-100	90-100	45-55	35-50	22-35
	10-60	Sandy clay loam, clay loam.	SC, CL	A-6, A-7-6	---	90-100	90-100	85-100	45-62	35-50	22-35
Papagua:											
129	0-16	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	90-100	50-75	15-35	<25	NP-7
	16-30	Sandy clay	SC, CL	A-7-6	0	95-100	95-100	85-95	45-60	43-50	21-30
	30-65	Sandy clay loam, sandy clay.	SC, CL	A-6, A-7-6	0	95-100	95-100	80-95	36-60	30-48	20-28
Papalote:											
30	0-17	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	90-100	50-100	15-35	<25	NP-6
	17-41	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	45-70	41-60	21-35
	41-65	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6, A-7	0	95-100	80-100	75-95	40-70	38-48	18-31
31	0-16	Fine sandy loam	SM, SM-SC, SC	A-2-4, A-4	0	95-100	95-100	90-100	25-50	<25	NP-8
	16-38	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	45-70	41-60	21-35
	38-65	Sandy clay loam, clay loam	CL, SC	A-6, A-7	0	95-100	80-100	75-95	40-70	38-48	18-31

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

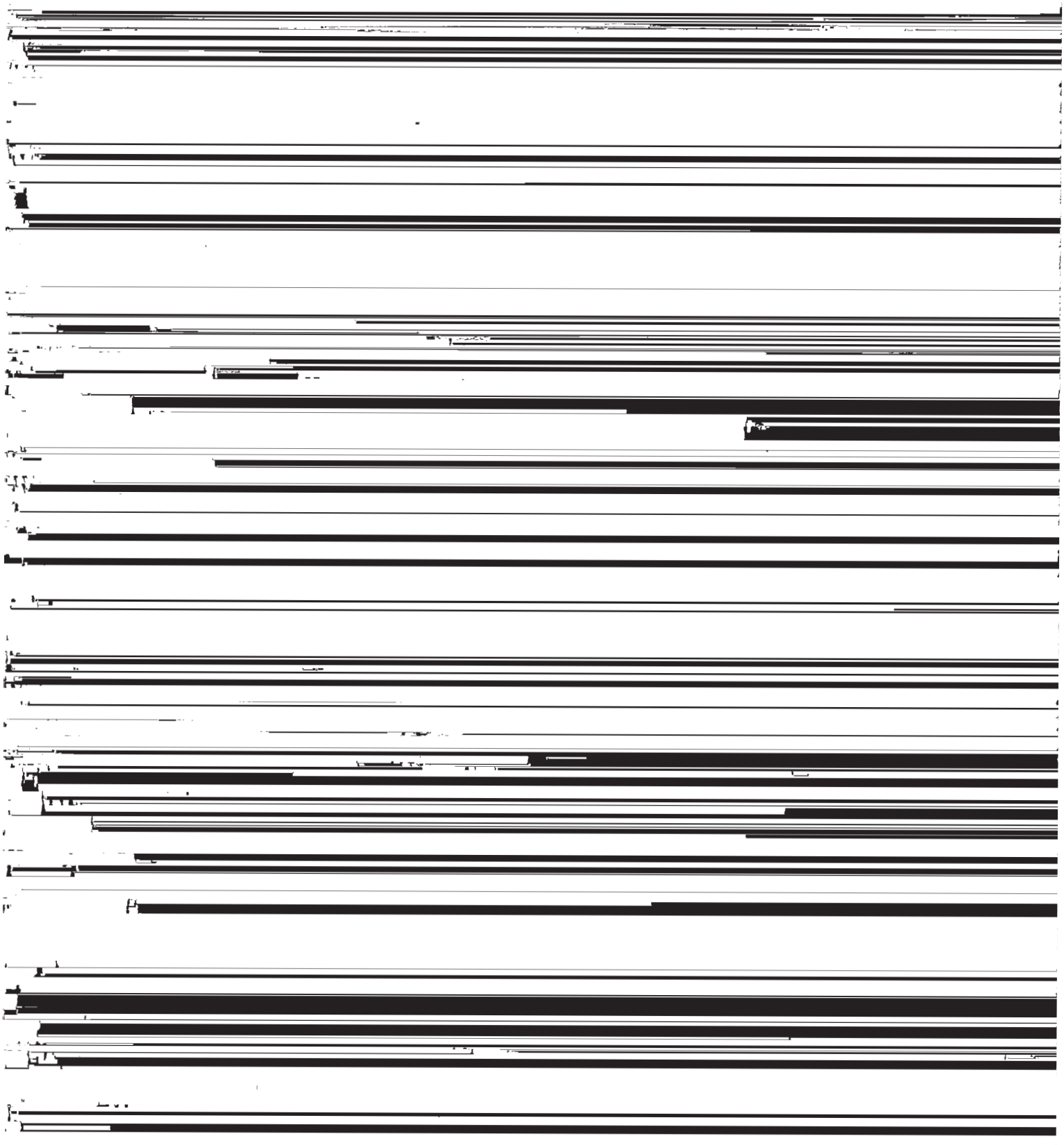

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors	
							Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH	Mmhos/cm					
Aransas:										
1, 2	0-65	<0.06	0.12-0.18	7.9-8.4	<4	High	High	Low	0.32	5
Clareville:										
3	0-11	0.6-2.0	0.12-0.20	6.6-7.8	<2	Moderate	Moderate	Low	0.32	5
	11-38	0.2-0.6	0.15-0.20	7.4-8.4	<2	High	High	Low	0.32	
	38-64	0.6-2.0	0.12-0.16	7.9-8.4	<4	Moderate	High	Low	0.32	
Comitas:										
4	0-32	2.0-6.0	0.05-0.10	6.1-7.3	<2	Low	Low	Low	0.17	5
	32-75	2.0-6.0	0.11-0.17	6.1-8.4	<2	Low	Low	Low	0.24	
Czar:										
5, 6	0-13	0.6-2.0	0.09-0.15	6.6-7.8	<2	Low	Low	Low	0.24	5
	13-68	0.6-2.0	0.10-0.18	7.4-8.4	<2	Low	Moderate	Low	0.32	
Danjer:										
7, 8	0-6	0.06-0.2	0.15-0.20	7.9-8.4	<4	High	High	Low	0.32	5
	6-65	<0.06	0.12-0.18	7.9-8.4	<4	High	High	Low	0.32	
Delfina:										
9	0-12	2.0-6.0	0.07-0.11	6.6-7.8	<2	Low	Moderate	Low	0.24	5
	12-36	0.2-0.6	0.10-0.20	6.6-8.4	<4	Moderate	High	Low	0.32	
	36-80	0.6-2.0	0.10-0.17	7.4-8.4	<4	Moderate	High	Low	0.32	
10, 11	0-11	2.0-6.0	0.11-0.15	6.1-7.8	<2	Low	Moderate	Low	0.24	5
	11-30	0.2-0.6	0.10-0.20	6.6-8.4	<4	Moderate	High	Low	0.32	
	30-80	0.6-2.0	0.10-0.17	7.4-8.4	<4	Moderate	High	Low	0.32	
Delmita:										
12	0-10	0.6-2.0	0.10-0.14	6.6-7.8	<2	Low	Moderate	Low	0.24	3
	10-30	0.6-2.0	0.12-0.15	6.6-7.8	<2	Low	Moderate	Low	0.28	
	30-32	---	---	---	---	---	---	---	---	
Edroy:										
13, 14	0-18	<0.06	0.10-0.17	7.9-8.4	<8	Very high	High	Low	0.32	5
	18-42	0.06-0.2	0.09-0.17	7.9-8.4	<8	High	High	Low	0.32	
	42-53	0.06-0.2	0.08-0.16	7.9-8.4	<8	Moderate	High	Low	0.37	
	53-72	0.06-2.0	0.05-0.15	7.9-8.4	<8	---	High	Low	0.43	
Goliad:										
15, 16	0-11	2.0-6.0	0.10-0.15	6.6-8.4	<2	Low	Low	Low	0.17	2
	11-15	0.2-0.6	0.15-0.20	6.6-8.4	<2	Moderate	High	Low	0.24	
	15-28	0.2-0.6	0.15-0.20	7.4-8.4	<2	Moderate	High	Low	0.24	
	28-32	---	---	---	---	---	---	---	---	
17, 18	0-11	0.6-2.0	0.12-0.17	6.6-8.4	<2	Moderate	Moderate	Low	0.17	2
	11-15	0.2-0.6	0.15-0.20	6.6-8.4	<2	Moderate	High	Low	0.24	
	15-28	0.2-0.6	0.15-0.20	7.4-8.4	<2	Moderate	High	Low	0.24	
	28-32	---	---	---	---	---	---	---	---	
Lacoste:										
19:										
Lacoste part	0-7	0.6-2.0	0.10-0.15	6.6-8.4	<2	Low	Moderate	Low	0.24	1
	7-12	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low	Moderate	Low	0.28	
	12-15	---	---	---	---	---	---	---	---	
Olmos part	0-9	0.6-2.0	0.05-0.10	7.9-8.4	<2	Low	High	Low	0.10	1
	9-25	---	---	---	---	---	---	---	---	
Lattas:										
20, 21	0-5	0.06-0.2	0.12-0.18	7.9-8.4	<4	High	High	Low	0.32	5
	5-70	<0.06	0.15-0.20	7.9-8.4	<4	High	High	Low	0.32	

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors	
							Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH	Mmhos/cm					
Leming:										
22	0-24	2.0-6.0	0.05-0.10	6.1-7.3	<2	Very low	Low	Low	0.20	5
	24-55	0.06-0.2	0.15-0.20	6.1-8.4	<2	Moderate	High	Low	0.32	
	55-65	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	High	Low	0.32	
Miguel:										
23	0-10	2.0-6.0	0.10-0.15	6.1-7.3	<2	Low	High	Low	0.43	5
	10-33	<0.06	0.14-0.17	6.6-8.4	<2	Moderate	High	Low	0.32	
	33-60	0.06-0.2	0.12-0.15	7.9-8.4	<2	Moderate	High	Low	0.32	
Odem:										
24	0-72	2.0-6.0	0.10-0.16	6.6-8.4	<2	Low	Moderate	Low	0.24	5
Oil-Waste land:										
25	---	---	---	---	---	---	---	---	---	---
Olmos:										
[1]26	0-9	0.6-2.0	0.05-0.10	7.9-8.4	<2	Low	High	Low	0.10	1
	9-35	---	---	---	---	---	---	---	---	
Opelika:										
27, 28	0-4	0.6-2.0	0.11-0.17	6.6-7.8	<2	Low	Moderate	Low	0.37	5
	4-10	<0.06	0.12-0.18	6.6-7.8	<2	Moderate	High	Low	0.43	
	10-60	0.06-0.6	0.10-0.15	7.9-8.4	<4	Moderate	High	Low	0.43	
Papagua:										
[1]29	0-16	2.0-6.0	0.07-0.11	6.1-7.3	<2	Low	Low	Low	0.24	5
	16-30	0.06-0.2	0.14-0.18	6.1-7.3	<2	High	High	Low	0.32	
	30-65	0.06-0.6	0.12-0.18	7.4-8.4	<2	High	High	Low	0.37	
Papalote:										
30	0-17	2.0-6.0	0.07-0.11	6.1-7.8	<2	Low	Low	Low	0.32	5
	17-41	0.06-0.2	0.13-0.18	6.1-8.4	<2	Moderate	High	Low	0.32	
	41-65	0.06-0.2	0.12-0.17	7.9-8.4	<2	Moderate	High	Low	0.32	
31	0-16	2.0-6.0	0.11-0.15	6.1-7.8	<2	Low	Low	Low	0.32	5
	16-38	0.06-0.2	0.13-0.18	6.1-8.4	<2	Moderate	High	Low	0.32	
	38-65	0.06-0.2	0.12-0.17	7.9-8.4	<2	Moderate	High	Low	0.32	
Parrita:										
32	0-5	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low	Moderate	Low	0.17	2
	5-9	0.6-2.0	0.12-0.17	6.6-8.4	<2	Moderate	High	Low	0.24	
	9-17	0.2-0.6	0.12-0.18	7.4-8.4	<2	Moderate	High	Low	0.24	
	17-24	---	---	---	---	---	---	---	---	
Pernitas:										
33	0-10	0.6-2.0	0.11-0.16	7.9-8.4	<2	Low	Moderate	Low	0.20	3
	10-28	0.6-2.0	0.13-0.18	7.9-8.4	<2	Moderate	High	Low	0.28	
	28-61	0.6-2.0	0.10-0.15	7.9-8.4	<2	Low	High	Low	0.32	
34, 35, 36	0-11	0.6-2.0	0.11-0.16	7.9-8.4	<2	Low	Moderate	Low	0.20	3
	11-30	0.6-2.0	0.13-0.18	7.9-8.4	<2	Moderate	High	Low	0.28	
	30-72	0.6-2.0	0.10-0.15	7.9-8.4	<2	Low	High	Low	0.32	
Pettus:										
37, 38, 39	0-17	0.6-2.0	0.10-0.15	7.9-8.4	<2	Low	Moderate	Low	0.24	2
	17-21	0.6-2.0	0.02-0.05	7.9-8.4	<2	Very low	Moderate	Low	---	
	21-65	0.6-6.0	0.08-0.12	7.9-8.4	<2	Low	Moderate	Low	0.24	
Pharr:										
40, 41, 42, 43	0-9	0.6-2.0	0.09-0.17	7.9-8.4	<4	Low	High	Low	0.24	5
	9-65	0.6-2.0	0.09-0.17	7.9-8.4	<4	Low	High	Low	0.32	
Pits:										
44	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors	
							Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH	Mmhos/cm					
Racombes:										
45	0-11	0.6-2.0	0.14-0.19	6.6-7.8	<2	Low	High	Low	0.28	5

TABLE 17.--SOIL AND WATER FEATURES

[The definition of "flooding" in the Glossary explains terms such as "rare" and "brief." Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			Cemented pan	
		Frequency	Duration	Months	Depth	Hardness
					In	
Aransas: 1, 2	D	Common	Brief to very long.	Sep-May	---	---
Clareville: 3	C	None	---	---	---	---
Comitas: 4	A	None	---	---	---	---
Czar: 5, 6	B	None	---	---	---	---
Danjer: 7, 8	D	None	---	---	---	---
Delfina: 9, 10, 11	B	None	---	---	---	---
Delmita: 12	C	None	---	---	20-40	Rippable
Edroy: 13, 14	D	Common	Brief to long	Sep-May	---	---
Goliad: 15, 16, 17, 18	C	None	---	---	20-40	Rippable
Lacoste: [1]19:						
Lacoste part	C	None	---	---	10-20	Rippable
Olmos part	C	None	---	---	7-20	Rippable
Lattas: 20, 21	D	None	---	---	---	---
Leming: 22	C	None	---	---	---	---
Miguel: 23	D	None	---	---	---	---
Odem: 24	A	Common	Brief	Sep-May	---	---
Oil-Waste land: 25	---	---	---	---	---	---
Olmos: [1]26	C	None	---	---	7-20	Rippable
Opelika: 27, 28	D	Rare to common	Brief	May-Sep	---	---
Papagua: [1]29	C	Rare	Brief	May-Sep	---	---
Papalote: 30, 31	C	None	---	---	---	---
Parrita: 32	D	None	---	---	12-20	Rippable

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Cemented pan	
		Frequency	Duration	Months	Depth	Hardness
					In	
Pernitas: 33, 34, 35, 36---	C	None---	---	---	---	---
Pettus: 37, 38, 39-------	C	None---	---	---	11-20	Rippable
Pharr: 40, 41, 42, 43---	B	None---	---	---	---	---
Pits: 44---	---	---	---	---	---	---
Racombes: 45---	B	None---	---	---	---	---
Runge: 46, 47, 48, 49, 50---	B	None---	---	---	---	---
Sarita: 51---	A	None---	---	---	---	---
Sinton: 52---	B	Common---	Brief---	Sep-May	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

Shrinkage		
Limit	Linear	Ratio
Pct	Pct	Pct
17.0	8.1	1.8
15.0	14.5	1.8
18.0	2.2	1.[illegible]
15.0	15.3	1.8
18.0	8.7	1.7
16.0	3.2	1.7
15.0	10.8	1.8
16.0	12.4	1.8
17.0	1.3	1.7
16.0	15.3	1.8
16.0	13.6	1.8
16.0	8.3	1.7
14.0	13.9	1.8

TABLE 18.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]										Liquid limit[2]	Plasticity index[2]	Moisture density		Shrinkage		
			Percentage passing sieve							Percentage smaller than--									
	AASHTO	Unified	7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture	Limit	Linear	Ratio
													Pct		Lb/Ft^3	Pct	Pct	Pct	Pct
Pernitas scl:[8] (S73TX-125-004)																			
A1------- 0 to 11	A-6 (07)	CL	100	100	100	100	100	100	54	--	23	18	35	19	--	--	16.0	9.2	1.8
B22t-----17 to 30	A-6 (13)	CL	100	100	100	100	99	99	66	--	40	32	40	24	--	--	40.0	12.3	1.8
C2ca-----36 to 72	A-6 (13)	CL	100	100	100	98	95	92	70	--	44	32	39	22	--	--	16.0	11.0	1.8
Pettus scl:[9] (S72TX-125-005)																			
A1------- 0 to 10	A-6 (02)	SC	100	100	100	100	99	97	48	--	19	15	27	12	--	--	15.0	16.2	1.8
B2-------10 to 17	A-6 (06)	CL	100	100	100	99	97	95	57	--	26	20	31	17	--	--	16.0	7.8	1.8
C2ca-----21 to 65	A-6 (07)	CL	100	99	97	91	82	75	56	--	30	19	35	18	--	--	17.0	8.7	1.7

[1]For soil material larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

[2]Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

[3]Goliad sandy clay loam:
2.7 mi w. of jct. co. rds. 236 & 237, 60 ft sw. in pasture.

[4]Miguel fine sandy loam:
1.7 mi w. of jct. US-281 & FR-625, 0.5 mi n. & 0.5 mi w. on pvt. rd., 40 ft s. in pasture.

[5]Opelika fine sandy loam:
From Alice, 1.8 mi ne. of jct Seven Bridge Rd. & Texas Blvd. & 200 ft se. in field.

[6]Papalote loamy fine sand:
2 mi s. of jct. US-281 & FR-716, 1 mi e. & 50 ft n. in field.

[7]Parrita sandy clay loam:
0.5 mi w. of jct. co. rd. 235 & US-281, 50 ft n. in pasture.

[8]Pernitas sandy clay loam:
4.1 mi w. of jct. co. rds. 236 & 237, & 0.3 mi s. in pasture.

[9]Pettus sandy clay loam:
10 mi n. & 2 mi nw. of jct. co. rd. 236 & US-281, 70 ft sw. in pasture.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aransas	Fine, montmorillonitic (calcareous), hyperthermic Vertic Haplaquolls
Clareville	Fine, montmorillonitic, hyperthermic Pachic Argiustolls
Comitas	Loamy, mixed, hyperthermic Arenic Aridic Haplustalfs
Czar	Fine-loamy, mixed, hyperthermic Pachic Argiustolls
Danjer	Fine, montmorillonitic, hyperthermic Typic Pellusterts
Delfina	Fine-loamy, mixed, hyperthermic Aquic Paleustalfs
Delmita	Fine-loamy, mixed, hyperthermic Petrocalcic Paleustalfs
Edroy	Fine, mixed, hyperthermic Vertic Haplaquolls
Goliad	Fine, mixed, hyperthermic Petrocalcic Paleustolls
Lacoste	Loamy, mixed, hyperthermic, shallow Petrocalcic Paleustalfs
Lattas	Fine, montmorillonitic, hyperthermic Typic Pellusterts
Leming	Clayey, mixed, hyperthermic Aquic Arenic Paleustalfs
Miguel	Fine, mixed, hyperthermic Udic Paleustalfs
Odem	Coarse-loamy, mixed, hyperthermic Cumulic Haplustolls
Olmos	Loamy-skeletal, carbonatic, hyperthermic, shallow Petrocalcic Calciustolls
Opelika	Fine-loamy, mixed, hyperthermic Mollic Albaqualfs
Papagua	Fine, mixed, hyperthermic Typic Albaqualfs
Papalote	Fine, mixed, hyperthermic Aquic Paleustalfs
Parrita	Clayey, mixed, hyperthermic, shallow Petrocalcic Paleustolls
Pernitas	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Pettus	Loamy, mixed, hyperthermic, shallow Typic Calciustolls
Pharr	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Racombes	Fine-loamy, mixed, hyperthermic Pachic Argiustolls
Runge	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Sarita	Loamy, mixed, hyperthermic Grossarenic Paleustalfs
Sinton	Fine-loamy, mixed, hyperthermic Cumulic Haplustolls

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